

# The Chemical Age

VOL LXI

23 JULY 1949

No 1567

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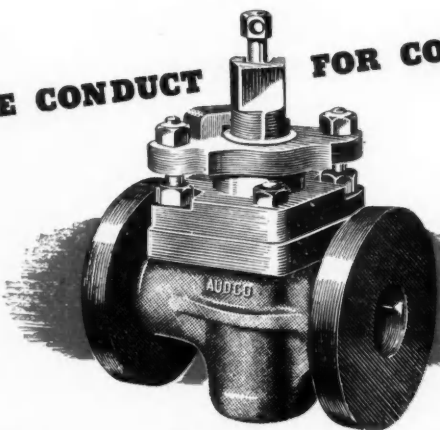
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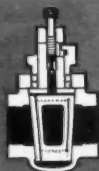
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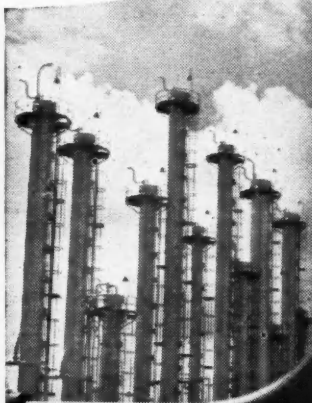
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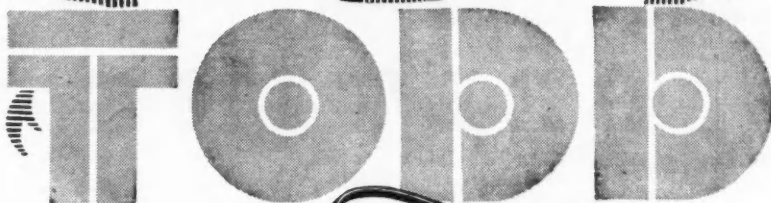


# INDEX TO ADVERTISERS IN THIS ISSUE

	Page		Page
Allen, Athole G. (Stockton), Ltd.	iv	Kilner, John, & Sons (1927), Ltd.	xix
Atmospheric Control, Ltd.	xv	Laporte Chemicals, Ltd.	viii
Attwater & Sons, Ltd.	Cover ii	Lennox Foundry Co., Ltd.	xx
Audley Engineering Co., Ltd.	i	Lodge-Cottrell, Ltd.	xiv
Black, B., & Son, Ltd.	xx	Manlove, Alliot & Co., Ltd.	xiii
Blackwell's Metallurgical Works, Ltd.	xx	May & Baker, Ltd.	vii
Bolton & Hayes, Ltd.	Cover iii	Mullard Electronic Products, Ltd.	xix
British Drug Houses, Ltd. (The)	136	Northern Glass & Instruments, Ltd.	Cover iv
Burgess Zeolite Co., Ltd.	xv	Paget, Dr. R. F.	xviii
Charwood (Sales), Ltd.	xx	Pascall Engineering Co., Ltd. (The)	Cover iv
Classified Advertisements	xvi, xvii, xviii & xix	Permutit Co., Ltd. (The)	xii
Essex Aero, Ltd.	xi	Quickfit & Quartz, Ltd.	135
Four Oakes Spraying Machine Co. (The)	Cover iii	Rozalex, Ltd.	Cover iii
Gas Council (The)	vi	Shell Chemicals, Ltd.	ii
Geigy, Ltd.	x	Spencer Chapman & Messel, Ltd.	Front Cover
Girling, S., & Sons (Coopers), Ltd.	xix	Sutcliffe, Speakman & Co., Ltd.	v
Glebe Mines, Ltd.	xv	Tanks & Drums, Ltd.	ix
Harris, Francis W., & Co., Ltd.	iv	Tenaplas, Ltd.	Cover ii
Houchin, Ltd.	Cover iii	Todd Brothers (St. Helens & Widnes), Ltd.	xiii
Imperial Typewriter Co., Ltd.	viii	Travis Smith, Thos., Ltd.	xx
Jackson, J. G., & Crockatt, Ltd.	xx	Wells, A. C., & Co., Ltd.	Cover ii
Jenkins, Robert, & Co., Ltd.	xiv		
Kestner Evaporator & Engineering Co., Ltd.	x		

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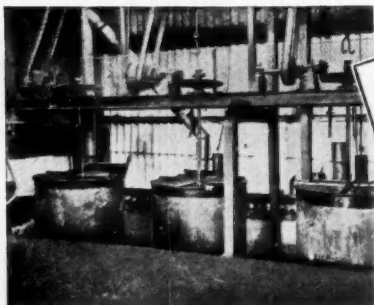
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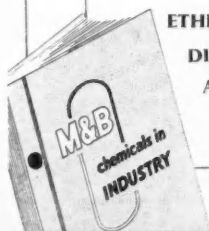
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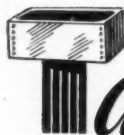
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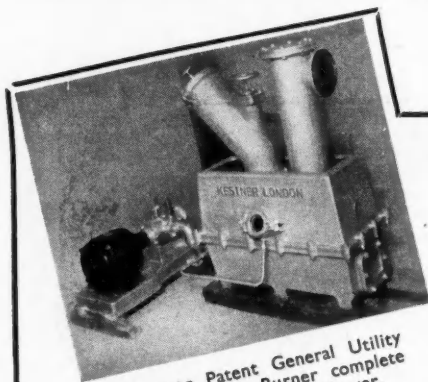
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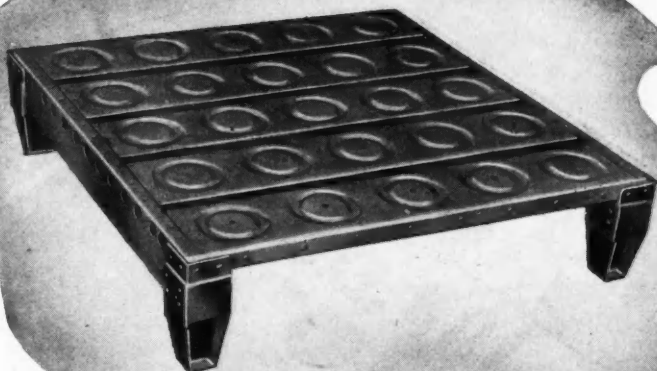
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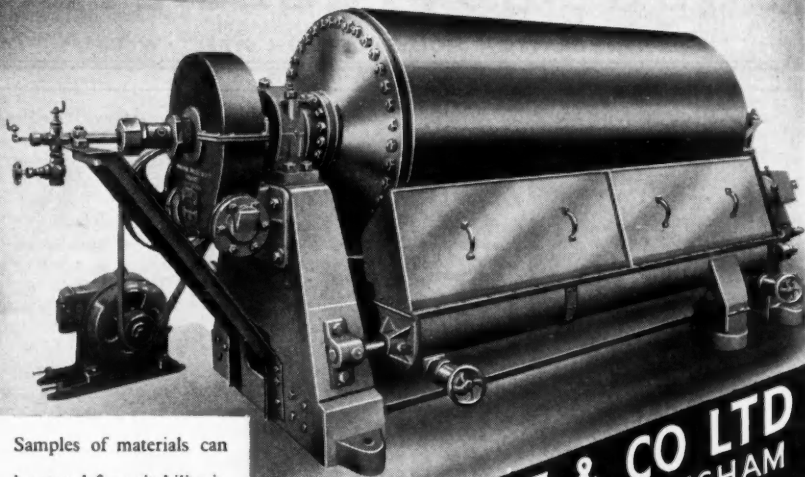
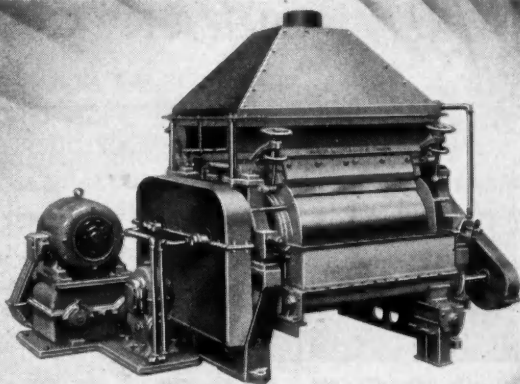
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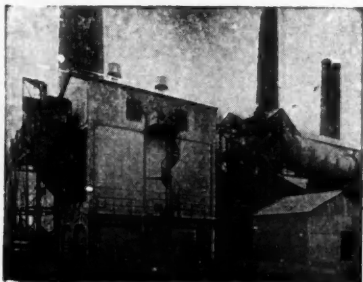
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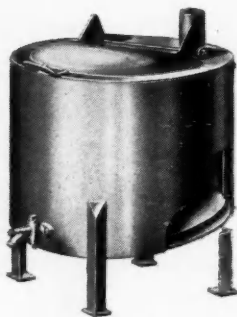


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Volume LXI

23 July 1949

Number 1567

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## Governments and Scientists

**F**EW forces have a more unifying effect than the candid recognition that there are at work powerful influences or groups designed to disrupt the things we know and respect. That deeply rooted human characteristic had its outstanding example on the grand scale in this country after 1939. The same familiar trend on a smaller scale has been discernible for some time among the scientific workers of many countries and the portents, as time goes on, become more conspicuous.

The growth of the perception among an increasingly large number of scientists that the principles that have been at the root of all reputable scientific inquiry in the past are now being sedulously undermined in one part of the world has found expression in the resignation in different countries of distinguished foreign members of the Soviet Academy of Sciences, and in the many testimonies to the truth of the fundamentals which Moscow and its satellites are so anxious to uproot.

The malaise which has given rise to this spontaneous resistance is now being seen by some as the manifestation—in its most virulent and repulsive form—of a current readiness in a very much wider field to engulf the scientist in the machinery of government. That, briefly, is the disturbing fact to which Sir David Rivett so effectually directed

the attention of Society of Chemical Industry members in Manchester last week in his parting address as president, before handing over the principal office. He had in mind chiefly the recent course of events in Australia, where the Council for Scientific and Industrial Research—for which he is the best qualified spokesman—has now been taken very directly under State control and may have lost some of its essential liberty to use its own initiative in promoting the best deployment of science in the interests of Australian industry. The future for the CSIR still remains in the balance. Given liberal and unbiased treatment by the Government departments to which it now appears to be in some important respects subordinate, there is no reason to expect that its great work for Australian agriculture and industry by the practical application of science to urgent material needs will be impaired.

There is, as the distinguished Australian did not fail to point out, good reason to hope that the transfer to the Government of the supreme authority in such matters as directing the course of research and the appointment of officers will not be followed by excesses of administrative zeal and the imposition of a smothering network of red tape. The disturbing fact remains that in Australia the most active group

## On Other Pages

### Leader:

Governments and Scientists . . . 105

### Notes and Comments:

No More "Bargains" . . . 107

Lucky Strike . . . 107

A Petroleum Anniversary . . . 107

Promising Coal Research . . . 108

Broadcast Science . . . 108

Food and Metals . . . 109

Streptomycin and PAS . . . 109

Waste Pickle Liquor . . . 110

A Disinfectant Detergent . . . 110

Economics of Coal Gasification . . . 111

Lead and Zinc Prices . . . 111

Chemists and the Commonwealth . . . 112

Methoxychlor . . . 116

Centrifugal Moulding of Plastics . . . 121

Coloured Asphalt Undergoing Road Tests . . . 121

Widening Range of Rubber Uses . . . 122

The Institute of Welding . . . 122

Chemical Prospects in China . . . 123

German Technical Reports . . . 123

Parliamentary Topics . . . 124

Science and Industry . . . 124

Technical Publications . . . 125

The Chemist's Bookshelf . . . 126

Acid Resistant Cement . . . 128

Indian Chemical Research . . . 128

Aromas and Textiles . . . 128

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of scientists have been deprived by legislative action of their authority, hitherto unchallenged, to direct their work in the light of their own observation of industry's needs, allied with their specialised knowledge of the newer aids which the sciences can proffer.

The forces which brought this result in Australia are not exclusively Australian. In England and all the Commonwealth countries, where science has reached an advanced stage, war made willing recruits of virtually all scientific workers, and the habit of command once it is acquired by governments is not lightly laid down. Their authority, as Sir David Rivett has observed, may gain public assent from the movement in opinion, coloured by some of the more sensational war-time results of the work of scientists operating in spheres not of their own choosing.

"The remarkable achievement of physicists and engineers in applying nuclear energy to purposes of war begot not only wide astonishment at, and admiration for, the work of these men," recalls Sir David Rivett. "It bred also an intense satisfaction that such developments should have occurred in our camp rather than in that of the enemy. Along with that,

however, came an emphatic desire to ensure that the use of the new engine of war should be denied for as long as possible to any potential future enemy.

No longer is attention limited only to the engineer's product of applied science. So has crept into men's minds, naturally enough, a feeling that all scientific work, even if it appears only remotely associated with war technology, must be closely guarded, controlled, in greater or less measure kept out of view; and even its directions of development kept under supervision. . . . If possible I want while here to find out more about your attitude to the problems that are involved, to see how you are tackling them, to learn how you view the attitudes of other countries to them; perhaps even to ask whether it would not be well to aim at some measure of uniform action within the Commonwealth to guard against common dangers to our own science and its associates."

It would be very revealing to know what answers have been given here to the inquiries of Australia's principal scientist. The dangers which he has recognised in his own sphere and which have materialised in a more extreme form in the U.S.A., sanctioned by the urgent demand for security in regard to atomic energy, are not wholly remote

(continued on page 108)

## Notes and Comments

### No More "Bargains"

THE see-saw of base metal prices, which produced the rapid downward and upward movements, all within the space of a few days last week, has fairly certainly not yet been firmly grounded. When we called attention in these notes last week to the alacrity with which the Ministry of Supply repented its first liberal impulse to supply electrolytic copper at around £104 per ton (and added a supplement of £3 10s.) the position of lead, which the Ministry had just reduced to £75 10s., was anything but stable. We said as much and speculated whether the Ministry had noticed what was going on in the U.S.A. It had, rather belatedly perhaps, and before that issue of THE CHEMICAL AGE had appeared had swiftly withdrawn its short-lived "bargain offer" for good soft pig lead, raising its price from £75 10s. to £81 per ton—£1 less than the rate which prevailed earlier. These afterthoughts largely reversed the easier conditions which appeared to be developing for the numerous chemical and metal industries depending upon the three commodities mentioned in the Ministry's first memorandum, except in respect of zinc, which was permitted to stand at £58 per ton (instead of £78). The sequence of events, however, had evidently not ended, as buyers feared, watching the upward movement of U.S. spot zinc prices this week. By Tuesday the Ministry of Supply had noticed that, too. Good ordinary brand zinc was hurriedly raised to £60 15s. per ton.

### Lucky Strike

RECALLING the emphasis which has been laid last week and this, during the current fourth Empire Mining and Metallurgical Congress, on the need for the fullest collaboration of scientists to discover and exploit the world's mineral resources, a story currently to hand has a quaintly irrelevant

flavour. It describes an accidental discovery of considerable deposits of manganese ore and is related by United States geologists, in a bulletin just released by the U.S. Geological Survey. It refers to the discovery of rich deposits of high grade ore, possibly amounting to more than 7 million tons, in the Serra do Navio District of the Amazon River Valley, Brazil. Samples from the site appear to indicate that the ores average about 50 per cent pure manganese. The discoverer is said to be Mario Cruz, a woodsman, who, prospecting for gold in 1941, picked a small rock from the shore as ballast for his canoe on the dangerous voyage down the Araguari River to Porto Grande. He later discarded and forgot the rock until 1946 when a Cleveland, Ohio, company began to prospect for iron in the region. Cruz recalled the incident of the piece of rock and took it to the governor of the territory, thinking it was iron. Samples were sent to Rio de Janeiro, where analysis showed it to contain 55 per cent manganese.

### A Petroleum Anniversary

AS the latest developments in petroleum chemistry become accomplished facts and multiply it is hard to believe that the source of all this is rooted in an industry not much more than 50 years old. Effective petroleum industry in Great Britain is as young as that; in 1899 our total mineral oil imports were 240 million gallons—enough to keep alight some few million smoky oil lamps and provide lubricants for some of our industrial machinery. Benzene for the first motor cars was so rare that the Automobile Club was distributing special maps showing where the few precursors of the filling station were located. The great field of petroleum chemistry had not been visualised. This near-miraculous growth is called to mind in a story which recreates much of the colour and records all the relevant facts of the modern ages of petroleum,



admirably assembled by *The Petroleum Times*, which has just celebrated its 50th year of continuous publication. It is the oldest oil journal in the world and can claim to have seen and recorded every significant phase in the industry, excepting, of course, those associated with the venerable Scottish shale oil workings, which were very active 50 years before *The Petroleum Times* saw the light. Its anniversary issue is replete with interest, even for those who are not oil technologists, and deserves to stand as a monument and a record of the struggles which have lead up to the growing wealth of oil products and petroleum chemicals. Already oil is Britain's largest export, of which the great refinery and chemical programme promises important increases.

### Promising Coal Research

**A** REVEALING comment on one effect of colliery nationalisation on coal technology was offered last week to some of the delegates of the fourth Empire Mining and Metallurgical Congress, who visited the private laboratories in London where the Powell Duffryn Technical Services is carrying on what is probably, from the chemical standpoint, the most important coal research in this country. It is designed to promote the much fuller use of the rich chemical derivatives of coal, the need for which was underlined by the congress president, Sir Henry Tizard, at the conclusion of the tour. "No one," he said, "can see a limit to what can be found out, of use to civilisation, by continuous study of the properties, the composition and the by-products of coal." Powell Duffryn, he reminded the congress delegates, had been put out of business as coal owners by nationalisation and had determined to devote its great technical experience and energies to research for this country and those of the Empire. Its laboratories, amply equipped and staffed, and research programme promise to produce important changes in the field of most coal chemicals.

### Broadcast Science

**T**HE interest of the layman in scientific matters and his desire for information and explanation of con-

temporary developments have never been so marked as they are now. That seems to have been recognised in the current inauguration by the B.B.C. of another series of six talks on "New Frontiers in Science" which was opened by Prof. N. F. Mott, Melville-Wills Professor of Theoretical Physics, Bristol University, with his talk last week on "What We Are Doing with Electrons." Chemistry gets a very fair share of attention in the subsequent talks. The second will be by Dr. Patrick Grove, director of the Radiochemical Centre, Amersham, who will explain how nuclear energy is helping to solve many chemical problems. The discovery of the connection between genes and inheritance will be the subject of the fifth talk by Prof. C. H. Waddington, Professor of Animal Genetics, Edinburgh University. The series, which Prof. Eric Ashby, of Manchester University, will sum up, shows in its composition a very lively sense of what is news and what is most useful to complement the meagre general information on topics likely to figure often in future affairs.

### GOVERNMENTS AND SCIENTISTS

(Continued from page 106)

from scientific affairs in the United Kingdom. Never have the sciences had so many friends in high places. The interest shown by members of the Government is at the moment wholly benevolent and facilitates the continuance of a very substantial financial support for science projects and education. There is, however, almost inevitably a strong disposition to effect practical improvements, of which the Development of Inventions legislation is an example, and the temptation to exert a greater measure of paternal control over the "productivity of impractical scientists" will be hard to resist. No results of that spirit are fortunately yet observable in the wide ranging programme of, for example, the DSIR. But such reassurance does not absolve those who share Sir David Rivett's embracing view of the responsibilities of scientists from emulating some of his vigilance.



## FOOD AND METALS

### *Interrelated Studies by DSIR*

THE far ranging character of the investigations necessitated by the Department of Scientific and Industrial Research studies of foodstuffs is disclosed in the currently issued report (for 1947), "Food Investigation" (HMSO, 6d.).

The close relationship between the behaviour of some metals and successful food preserving accounts for the inclusion of an interesting note on the oxidation of aluminium.

The report observes that a highly resistant film of oxide can be formed on the surface of aluminium merely by immersing the metal in boiling water. The rate at which the film forms and the time taken for its completion depend upon the purity of the metal. The action is much greater with super-pure aluminium than with lower grades of metal, probably because the latter contain more silicon; it is reduced by adding traces of silicic acid to the water. The film consists of the monohydrate of alumina ( $\text{Al}_2\text{O}_3 \cdot \text{H}_2\text{O}$ ).

The corrosion of aluminium (90.25-99.993 per cent purities), aluminium-manganese (1.17 per cent Mn) and aluminium-magnesium-manganese (1.78 per cent Mg, 0.48 per cent Mn) alloys by 0.1 N citric acid solution increases progressively with an increase of temperature of 25° to 95°C. (77° to 203°F.) and is very rapid at 95°C. (203°F.).

The presence of 0.1 N sodium chloride in the citric acid solution has a very pronounced effect in increasing the corrosion at 25°C. (77°F.) and a small or negligible effect between 60° and 95°C. (140° and 203°F.).

### *Stainless Steel*

The effect of citric acid, sugar and other constituents of food upon stainless steel has also been made the subject of studies. The report recalls that difficulty has been experienced in industry in finding suitable containers for warm citrus juices and syrups containing small amounts of sulphurous acid. Since most of the common metals are unsuitable for this purpose, corrosion tests designed to ascertain the probable behaviour of different types of stainless steels under factory conditions were carried out with a solution containing citric acid (4 per cent), sodium chloride (0.5 per cent), sugar (30 per cent) and 700 p.p.m. of sulphur dioxide maintained at 60°C. (140°F.). The steels fell into two classes, resistant and non-resistant, and further work is being carried out to account for this difference.

## STREPTOMYCIN AND PAS

### *Their Use in Treating Tuberculosis*

THE recent second Commonwealth and Empire Health and Tuberculosis Conference, in London, sponsored by the National Association for the Prevention of Tuberculosis, afforded some new light on "Trends in the Modern Treatment of Tuberculosis, Including Streptomycin and PAS."

Dr. Geoffrey Marshall, of Guy's and Brompton Hospitals, in his paper, said streptomycin was a treatment of great value, but with unfortunate limitations. He mentioned the Medical Research Council's trial of streptomycin, which had been carried out with scientific controls of a stricter order than ever before in the trial of any treatment for tuberculosis. Streptomycin had achieved wonderful results in tuberculous meningitis—complete recovery in 40 per cent of cases, whereas before the death rate was almost 100 per cent.

### *Limited Usefulness*

In pulmonary cases, said Dr. Marshall, streptomycin was only useful for a short time, and only once for any one patient, owing to the development of streptomycin-resistant bacillus, but it could be an adjunct to other treatment if its limitations were realised. "Do not use streptomycin because it may be good for a patient, but only when it is indispensable."

Dr. C. J. Beckwith, of the Canadian Tuberculosis Association, reported on the use of streptomycin for the treatment of the disease in the Dominion.

### *PAS on Trial*

Professor Lehmann, of Gothenburg, gave a description of work in Sweden with PAS (para amino salicylic acid), a new drug which is now on trial in England. He said one of the values of this drug was that it could be given in large quantities for long periods of time. A report on a group of 205 pulmonary cases showed that, in the majority of them, progressive pulmonary tuberculosis had been converted into a healing phase.

Intestinal tuberculosis cases had, said Professor Lehmann, given perhaps the most satisfactory results with PAS treatment—19 out of 20 showed definite improvement—and in 70 per cent of urogenital cases the bacilli disappeared within a year. Possibly, combined treatment, i.e., with streptomycin, might be the most successful in the end, and these drugs could not be considered as a substitute for other methods.

## WASTE PICKLE LIQUOR

### Prospects of More Profitable Recovery

**P**PROMISING results from recent studies of ways of reducing the undesirable characteristics of waste pickle liquors from metal processes are among the many interesting advances made during 1948-49 by workers at the Melton Institute, Pittsburgh, U.S.A. An account of this, appearing with many other records of chemical and scientific interest in the 36th annual report of the Melton Institute, discloses that the multiple fellowship studying acid recovery under the patronage of the American Iron and Steel Institute, has conferred with representatives of a number of steel companies on specific disposal problems.

### Coke-Oven Ammonia

The process for treating waste pickle liquor with raw coke-oven ammonia has been carried to a point where technical details have been solved on a laboratory scale. Ammonium sulphate uncontaminated by coke-oven gas constituents can be prepared, but the high sulphur content of the iron oxide by-product indicates that this material may have to be discarded. The process awaits evaluation on a pilot-plant scale.

A study of means for improving the quality of the sludge from neutralisation of stainless steel pickle liquor has demonstrated that up to 40 per cent of its iron content can be selectively precipitated by lime slurry without co-precipitating chromium or nickel. Although this method requires a two-stage neutralisation, enrichment of the sludge in chromium and nickel may provide economic justification for it.

Further investigation, says the report, has been given to the recovery of manganese from low-grade ores by leaching with waste pickle liquor.

It has been found that the manganese can be leached practically completely in less than 30 minutes from ore ground to about 60-mesh and that, by minor changes in the leaching technique, the rate of filtration of the slurry can be improved substantially. This research suggested the possibility of recovering manganese from open-hearth slags by a similar process.

In this instance, however, a sound process could not be developed because only the free acid in the pickle liquor is effective as a leaching agent, and both

(Continued at foot of next column)

## DISINFECTANT DETERGENT

### High Antibacterial Value

**A**NEW surface-active agent, called Oronite quaternary ammonium chloride ATM-50, said to be 250 times stronger than carbolic acid, is expected to find wide use in the disinfecting and associated fields.

Made from petroleum raw materials, the cationic material is the latest addition to the growing number of quaternary ammonium compounds and is expected soon to be in commercial production by the Oronite Chemical Company, New York. Technically, it is quaternary ammonium chloride ATM-50, an alkylbenzyl formulation available as a 50 per cent aqueous solution. It is said to be non-toxic and not a skin irritant.

The new compound, according to Mr. R. I. Stirton, of the Oronite Company, inhibits the growth of such organisms as *Staphylococcus Aureus* in dilutions as high as one in a million parts, and dilutions as high as one in 4500 are adequate to kill such organisms within 10 minutes. Under standard conditions ATM-50 is claimed to be more than 250 times as effective as phenol in destroying the organism responsible for typhoid fever.

Colourless and odourless and stable under all reasonable conditions of use, the solution is compatible with non-ionic detergents and various inorganic builders such as tetrasodium pyrophosphates. This compatibility renders the product particularly useful in the preparation of detergent-sanitisers.

In addition to high germicidal activity, ATM-50 exhibits a high level of surface activity. A concentration as low as 0.001 per cent is said to reduce the surface tension of water to approximately one-half of its normal value, and a concentration of 0.01 per cent will reduce the interfacial tension between water and White Oil to less than one-tenth.

silica and magnesia are leached from the slag. The silica contaminates the iron oxide by-product and the magnesia appears in the manganese concentrate; their removal has been studied and found to be impractical.

There is good evidence that the market for ferric sulphate could be expanded considerably if its cost of manufacture could be lowered. An investigation of means for converting the iron in waste pickle liquor to ferric sulphate shows promise that a successful process may be developed.

## ECONOMICS OF COAL GASIFICATION

### Results of U.S. Liquid Fuel Experiments

From OUR NEW YORK CORRESPONDENT

THE first successful full-scale test run, marking a significant development in America's research programme to develop synthetic liquid fuels from coal, has just been completed at the U.S. Bureau of Mines' new coal gasification unit at Louisiana, Missouri (THE CHEMICAL AGE, 60, 622-3, 924-5), during which some 70,000 standard cu. ft. per hour of gas were produced.

A part of the bureau's gas synthesis (Fischer-Tropsch) demonstration plant, this coal gasifier—probably the largest unit ever installed for direct production of synthesis gas from finely powdered coal and oxygen—is the second of the plant's five units to be completed. An oxygen production unit has been in operation for several months, and it is anticipated that the remaining units for gas purification, hydrocarbon synthesis, and product refining will be finished and placed in operation during 1950.

Gasification, however, is the most important cost and process problem now requiring solution before competitive motor spirit and oil can be made from coal by either of the two basic processes employed in the recently installed plants at Louisiana. In the Fischer-Tropsch process, the synthesis gas—a carbon monoxide and hydrogen mixture—obtained by coal gasification constitutes roughly 60 per cent of the cost of the liquid fuel products. In the coal-hydrogenation process, the hydrogen obtained represents 40 per cent of the product cost. Therefore, the bureau states, a low-cost gasification method applicable to all types of coal is imperative.

The new type continuous gasifier at Louisiana does not require the use of coking coals. The unit is designed to use about 28 tons of coal, 24 tons of oxygen, and 35 tons of superheated steam, and to produce some 2 million cu. ft. of raw synthesis gas daily.

In a preliminary six-hour test run conducted below design rates and below normal operating temperatures, only one of the six burner tubes was used. There was no evidence of any undesirable condition at the time of the voluntary shutdown.

Recently, as part of a 10-hour period of operation, a four-hour test was made with all six burners operating at design

capacity and with gasifier temperatures averaging about 2200°F. During this period the feed rates were: Coal 2300 lb. per hour, oxygen 17,000 standard cu. ft. per hour, steam 2000 lb. per hour.

Approximately 70,000 standard cu. ft. per hour of gas were made containing: 37 per cent carbon monoxide; 42 per cent hydrogen; 16 per cent carbon dioxide; 4 per cent nitrogen; 1 per cent miscellaneous.

Bureau of Mines engineers are hopeful that they can reduce the carbon dioxide content and obtain a higher yield of still better synthesis gas in subsequent runs after they have become more familiar with the operating characteristics of the new gasifier. Considerable work remains to be done before the gasifier is put in continuous operation. However, the trial runs apparently could have been maintained over longer periods and are considered encouraging.

## LEAD AND ZINC PRICES

### Upward Revision of New Rates

IN view of the rise in the price of lead on the American market, the Ministry of Supply has announced that the price of good soft pig lead is increased by £5 10s. per ton (delivered)—from £75 10s. to £81. Discounts and premiums remain unchanged.

Additional charges on orders booked for delivery subsequent to the month of order, are also unchanged. The new price has effect from July 14.

On Tuesday this week the Ministry notified an increase in price of good ordinary brand zinc from £58 to £60 15s., delivered.

The Ministry also announces that in future the prices at which copper, lead, zinc and tin will be sold (subject to licence) to consumers in the United Kingdom will be the prices ruling on the date the order is posted, and not on the date the order is received at the Non-Ferrous Metals Directorate, Rugby.

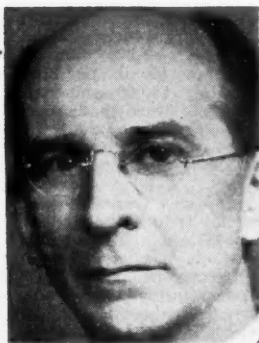
### Cornish Tin Company's Expansion

Geevor Tin Mining Co., Ltd., of St. Just, Cornwall, has drawn up a development programme estimated to cost £100,000.

## Chemists and the Commonwealth

### Great New Responsibilities—and Some Hazards

by SIR DAVID RIVETT



*Sir David Rivett, part of whose presidential address to the Society of Chemical Industry is reproduced here, makes a strong case for the continued independence of scientific workers, whose decisive contribution to the development of backward areas he has studied as head of the CSIR in Australia*

**I**T would doubtless be appropriate to focus attention mainly on specifically chemical interests; but chemists to-day probably recognise more fully than many others in the scientific fraternity how artificial have become the boundaries and sub-divisions of sciences, which have been useful enough in the past, but which are so rapidly losing all significance.

When, for example, one approaches a problem of pest insect control, may it not well be that a physicist, aided by a mathematician and guided by a chemist, will prove of more value than any other worker? We no longer grant an exclusive lease of the entomological field to those people who would regard themselves as "specialists" in the sub-division of entomology.

I shall not ride that particular hobby horse of mine which carries one to the conclusion that a chemist to-day usually finds his field in applied science to be like a paddock in North Australia—quite without boundary fences. And the farther we go the more will the sub-dividing fences in industrial science vanish and the more definitely will stand out the need for

mutual aid and community attack on the problems of our time. But what are "the problems of our time"? What determines them—classifies them?

Possibly among many noteworthy changes in popular outlook which have resulted from two world wars and an intervening period of doubt, there stands out the altered attitude of people in general, and so of their rulers, towards scientific effort of every kind. We need not pretend that this is a sign of sudden widespread passion for increased knowledge of Nature; for broader culture. No one will be quite so devoid of a sense of humour as to maintain an idea of that delightful kind.

What, then, has brought it about? Perhaps if a single cause is to be sought for the contemporary general interest in scientific work, taken by such people as would have cared little or nothing for it a few decades ago, this cause can be expressed in the single word "fear"—the obsession of fear, which one meets everywhere to-day.

One sees fear influencing policies, points of view, attitudes towards individuals, relations between groups of men. And this leads naturally enough to a strong desire for an increase in power to combat the objects of fear, and logically and rightly enough, such power is sought partly in greater understanding of Nature, greater ability to divert her powers to our own selected ends.

#### Population and Food

For the moment, put out of mind the fear that is associated with the word war and all that it connotes. Fix attention on a peace-time problem though not because it is easier, simpler, or less dire in its possibilities than the war problem. This problem can be suggested in the two words: population and food.

I make no apology for bringing so grave a matter before a society the prime interest of which is industrial chemistry, for that is precisely where it belongs. If ever there was a subject fundamentally chemical, surely it is the study of human metabolism and all that goes to its maintenance.

On many of its main issues we are not well informed. The chemistry of food-stuffs, their direct production from the

soil by reactions of fascinating difficulty, their manufacture by synthetic or other means, their changes when they enter that amazing laboratory which is the animal body, these are surely in the chemist's arena.

Therefore on him lies the grave responsibility for developments to meet a very broad human problem; and this brings us at once to a host of questions with which fundamental and applied science must grapple.

You know of the efforts that are being made at present to increase food supplies from Australia to this country and Europe, let alone to Asia. You may have heard of plans for large-scale conversion of vegetable protein and carbohydrate into animal protein and fat in the northern parts of Australia. You may have been given a delightful picture of unused grass growing waist high down there over huge areas. So it does—usually for three months out of twelve. For the remaining time there is relative famine for the herbivorous chemical converters—the sheep and the cattle.

Storage of water and irrigation are cited at once by wet-season visitors as the solution. Yet every chemist knows that water and soil do not themselves, even under right temperature conditions, suffice to yield nutritive pastures. There may be abundant apparent feed in these regions and yet cows will fail to maintain weight and condition as soon as there are added the strains of pregnancy and lactation.

It is a situation that calls for biochemists of a high order of ability; political and commercial magnates will not deal with it adequately. Indeed, it is a tragic fact that "practical" improvements, such as additional water supplies, may result in utter devastation of certain types of land. Of that, there is only too much evidence available, indicating that in the past, control has not been in the right hands.

Time does not permit me to give even the summary of specific examples which I had prepared. I must be content to name just a few.

#### An Organic Problem

If, for instance, anyone is looking for an attractive problem on the organic side, one can be provided in south-western Australia, in certain parts, of which grave fears are entertained for the future of sheep-breeding. An unforeseen result of the wide spread of the legume, subterranean clover, has been the development of a modified strain which, if eaten by sheep in excessive proportion to grasses, causes rather profound changes in the reproductive systems of the animals. Ewes

are unable to carry fetuses to maturity, while with wethers the development of mammary glands presents an unusual phenomenon. That something of the nature of an oestrogen is produced in the clover is a suggestion. The study of it, of the reason for its occurrence, of ways perhaps of preventing its production, is an attractive field for the biochemist.



Mr. Stanley Robson, 1949-50 SCI president

Then there is the case of tracts of country like the Ninety-mile Desert, of about 2 million acres, at the lower boundary of South Australia and Victoria. Rainfall is good; soil sandy; natural vegetation—contemptible. But chemists have shown that expenditure of a few shillings per acre on the appropriate chemicals will enable this useless terrain to develop a carrying capacity of three sheep to the acre.

An important empirical result this; but we must find out why 5s. worth of zinc or copper or cobalt salts enables us to grow 60 or 70 lb. weight of fat lamb. In the absence of such knowledge, we cannot feel certain of our ability even to conserve our newly-won productive capacity. I have no confidence in the "practical farmer" as a conservator of agricultural lands. The farmer may become a destroyer. He needs and he must have far more assistance, based on fundamental scientific knowledge, than we have yet doggedly set ourselves to provide for him. Tasks for the chemist and his associates are to be found all over the place.

I shall merely mention in passing the artesian water studies that clamour for attention; but there is one other aspect of the water problem to which one may draw brief notice. It arises in arid areas; and what an extent of them we have in the British Empire! As rocket ranges they may serve a purpose. As potentially pro-

ductive regions, either under stimulated rainfall or under irrigation, they present highly attractive questions to the chemist.

One need only recall quite simply instances of effects following addition of water to systems in equilibrium in its absence, to realise the possibilities of changes in arid soils that may follow their watering.

I remember an occasion, in the Mildura region, one blazingly hot afternoon, when I suddenly came upon quite a large field covered with what from a distance looked like one of your beautiful winter morning hoar frosts; a white crystalline carpet over a ploughed surface. Analysis showed it to be nearly pure sodium sulphate.

### Double Decompositions

From a complex mixture of clays, gypsum, salt and what-not in the soil, quite simple double decompositions accounted for its presence. Block after block of land has been "salted" out of production, becoming quite useless.

We know a good deal about all this now, and over the years have steadily brought back fertility to numbers of ruined vine and citrus properties; but the chemistry and physics of these heterogeneous equilibria require keener study than has yet been given to them.

[Sir David Rivett went on to describe briefly the history of the Australian Council of Scientific and Industrial Research, of which he is head, and the factors which had recently threatened to reduce its independence of scientific action.]

It is neither necessary (he continued), nor is it my intention, to talk of any of the achievements of this council of 20 scientific men who through an executive committee of three (later five) maintained close contact with the activities of a rapidly growing staff.

Although monetary expenditure is no indication of scientific success, it is perhaps pertinent to say that whereas Mr. Bruce set the council on its road with half-a-million pounds, which lasted it for six or seven years, the provision for the last single financial year amounted to two and a quarter millions, excluding funds for capital work.

### Scientific Needs

The outstanding gift of successive Governments to the Australian CSIR was that of freedom to pursue its investigations in accordance with its own estimate of the scientific needs of the country and the scientific ability available to cope with them. The council was not built on the normal departmental pattern. That pat-

tern is, I have no doubt, admirable for services in which policy and programme are laid down at the higher levels, and where successive layers of officers are there to fulfil the requirements and the orders passing down from above, in most cases originating in the ministerial stratum.

Scientific work cannot, I fear, be developed satisfactorily along that pattern.

The council was permitted to take charge of its own staffing. Its men did not come under the Public Service Act, and the Public Service Board was not responsible for the selection of staff or for laying down the terms and conditions of appointment.

The head of the Commonwealth Board in 1926, who at first opposed the suggestion that the CSIR should be outside his jurisdiction, declared some years later that the Bruce Government had taken the right line, since there would never have been the subsequent development of the CSIR had it been obliged to work under the auspices and in accordance with the procedures, classifications, etc., of his board. That board was designed for purposes very different from those to be served by the council.

[Sir David Rivett then reviewed the post-war concentration on "science, secrecy and security" which had helped to bring about a new attitude towards the administration of scientific work.]

### Peacetime Activities

Actually, we in the CSIR (he continued) were concerned with but very little defence work; we had shed our responsibilities of the war years just as rapidly as possible. Under the Bruce Act our duties lay in scientific development of primary and secondary industries in peace-time; we hurried back to them, joyfully.

Therefore as early as 1947, we had urged that work related to defence technology should not be in our hands; a decision accepted by the Government and generally approved. It was agreed that the Department of Supply should take responsibility for all such activities, this department being administered under the Public Service Act.

An immediate result was to place the Division of Aeronautics under Supply, it being considered that as it was deeply interested in high speed developments, its work had more immediate significance for military than for civil aviation. The transfer occurred quite recently and results must be watched and judged in the true and correct experimental spirit.

When it came to the point of legalising this change, a short Bill was passed



through Parliament authorising the transfer to any selected department, by mere proclamation, of any work or class of work specified. To the intense disappointment of many of us, the original intention to limit the possibility of such transfers to work associated with defence only was abandoned, and efforts to restore the limitation failed in both Houses.

The position at the moment therefore is that the road is legally clear to put any or all of CSIR's work under a normal department administered in accordance with the Public Service Act.

This danger is tempered by Ministerial declarations in second reading debates that there is no immediate intention to transfer any other divisions than that of aeronautics. May it long remain so. But will it? Personally I am anxious about the future.

#### Departmentalisation

Tribute has already been paid to the sympathetic way in which the representations of the CSIR and its friends were considered by the Government, and it was with some satisfaction, that when, recently, the whole of the original legislation of 1926 was repealed and a new Act passed by Parliament to replace it, we found that we had at least escaped direct departmentalisation under Public Service Board control.

[The speaker briefly summarised the changes wrought by the new control. First, he said, all the powers and functions vested in the council have been taken from it and placed in the hands of an executive of five, three with scientific training and giving full-time service, on seven-year tenures; two part-time and not necessarily with any experience in science. One of them will be a Treasury official.

A council with similar personnel to the present council would be set up, but purely as an advisory body; the executive would be obliged to take action in relation to any matter referred to it by the Minister; and the appointment of officers and others would be subject to conditions similar to those operating under Public Service Board administration.]

#### Freedom of Science

I would like (he added) to try and summarise in a sentence or two a situation which may correctly enough be described as difficult. It is not just a local Australian situation. I suspect South African science is already concerned; New Zealand certainly is; maybe Canada, and from what I have already heard, even the calm United Kingdom may feel some measure

of interest in it. How very interested we in Australia were in the guarded words of Sir Robert Robinson in his anniversary address to the Royal Society last November. You may recall his plea for alertness in preserving intact the prized freedom of science, and his warning that while no direct attack was likely here, "it could conceivably take the more subtle form of control of the character and direction of our scientific work."

I do not profess to know the way out of the maze. Even the best practicable solution may have to be a compromise containing much that is as inadvisable as it may be unavoidable. Am I wrong in feeling that here is a situation best handled in concert by men of broad outlook, capable of seeing every side of the problem as it exists to-day?

I think that from the scientific side we owe it to the political folk to do our very best to help them solve a puzzle for the propounding of which we must accept some responsibility. Unless we can prove to them that their responsibilities can be discharged by methods which will not in our view and on the basis of our experience, handicap the progress of science and its application, we shall have only ourselves to blame.

#### NEW SCOPE FOR LAPORTE

##### Acquisition of Hunt Brothers (Castleford)

**A** NOTICE from the chairman of Laporte Chemicals, Ltd., Mr. L. P. O'Brien, discloses the company's intention to acquire the entire issued share capital of Hunt Brothers (Castleford), Ltd., which carries on business at the Aire & Calder Chemical Works, Castleford, Yorkshire. The purchase price is £261,000, payable by £23,500 in cash and the balance by the issue of 250,000 ordinary fully paid shares of 5s. in Laporte Chemicals, Ltd.

Hunt Brothers (Castleford), Ltd., whose principal products are sulphuric acid, hydrochloric acid, and sodium sulphate, has a private railway siding, and also water connection with the Aire & Calder Navigation's waterways. The site affords land available for development.

It is proposed that the authorised capital of Laporte shall be increased from £1 million to £2 million. The directors state that they have in mind the possibility of a bonus issue, using part of the share premium account for this purpose.

An extraordinary general meeting of Laporte Chemicals, Ltd., for the purpose of giving effect to the necessary resolutions, is to be held at the Chamber of Commerce room, Luton, on August 5.

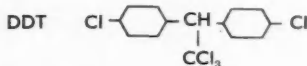
# Methoxychlor

## Characteristics of a Potent DDT Analogue

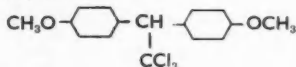
by R. W. MONCRIEFF

"**METHOXYCHLOR**" is the name given to the methoxy analogue of DDT, a compound which has a much better knockdown effect than DDT itself and a toxicity of the same order. Its development has now reached the pilot plant scale and it seems likely that Methoxychlor may in part supersede DDT, or, more probably, that it may be mixed with DDT, just as in the past pyrethrins have been added to it (DDT) to improve its knockdown.

The name "Methoxychlor" was filed in the Trade Mark Division of the Patent Office, Washington, for recording as a common name for the chemical 2,2-bis-(*p*-methoxyphenyl) 1,1,1-trichloroethane. The structures of the two compounds are these:—

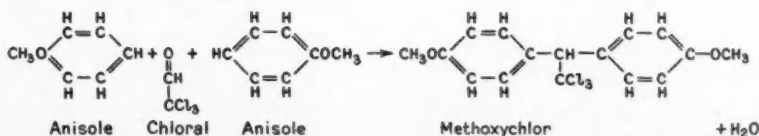


Methoxychlor



The name was not accepted without very careful consideration; those consulted included: the Council on Pharmacy and Chemistry of the American Medical Association, the Committee on Insecticide Terminology of the American Association of Economic Entomologists, representatives of the Public Health Service, Food and Drug Administration, Bureau of Entomology and Plant Quarantine, and the Committee on Nomenclature of the American Chemical Society.

DDT was first made about 70 years before its insecticidal properties were appreciated; Methoxychlor also waited over 50 years for recognition of its utility. The reaction by which it was first made may be expressed:—



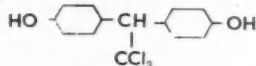
It was first prepared by Elbs<sup>2</sup> from chloral hydrate and anisole, which were condensed in the presence of sulphuric acid, the operation being carried out in solution in glacial acetic acid.

It was later made by Harris and Frankforter,<sup>3</sup> using aluminium chloride, instead of sulphuric acid as the condensing agent, at a temperature of 0° C. in the presence of a tenfold volume of carbon disulphide. They isolated dianisyltrichloroethane (Methoxychlor) as a solid, melting at 94° C., and obtained it in 94 per cent yield. They prepared a large number of similar compounds including DDT itself, its ethoxy analogue, and various similar compounds such as dianisyltribromoethane, dianisylbromoethane and dianisylbromoethane. They also showed how such compounds could be converted into the ethylenic derivatives by loss of hydrogen chloride to alcoholic potash.

They may now appear to have been rather unlucky not to have observed the insecticidal properties of these compounds during what must have been an extended research carried out at Minneapolis.

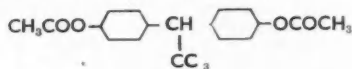
P. Luger, H. Martin and P. Muller<sup>4</sup> of the Geigy Co. reported that the compound (Methoxychlor) possessed some insecticidal effectiveness ("wirksam") but did not describe with what species of insects it had been tested, nor did they give particulars of the concentrations required for toxicity.

Martin and Wain<sup>5</sup> reported also that the compound had some insecticidal activity, but again without specifying the nature of the test insects nor the toxic concentrations. They did, however, state that it was more toxic than the hydroxy analogue, dihydroxydiphenyltrichloroethane,



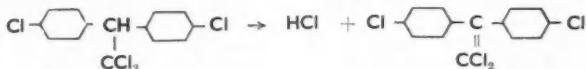


or than the acetyl derivative,



and this more marked activity they attributed to the less polar characteristics and the consequently higher lipoid solubility.

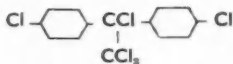
Martin and Wain (*loc. cit.*) expressed the view that its toxicity, like that of DDT itself, was due to the dehydrochlorination that the substance (now known as Methoxychlor) would undergo. That the toxicity of DDT and of related compounds was in fact due to the loss of hydrogen chloride (which was fatal to the insect) seemed to Martin and Wain to be evident from the fact that dichlorodiphenyl dichlorethylene, which resulted when hydrogen chloride was split off from DDT (below) was non-toxic to insects:



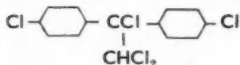
They followed up the matter and extended their view to benzene hexachloride, to chlorinated indanes and terpenes and were in some cases able to predict the insecticidal activity of some compounds. The toxicity of Methoxychlor in the view of Martin and Wain was due to

- (a) its ability to lose hydrogen chloride *in vivo*
- (b) its lipoid solubility.

In support of these views it may be noted that Laüger *et al*<sup>7</sup> found that the compound,

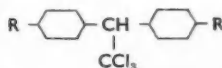


similar to DDT except for the extra substituted chlorine, is inactive; it could not lose hydrogen chloride. On the other hand the compound,



is a good insecticide (*massig wirksam*) and this compound could lose hydrogen chloride. Note too that it does not possess the  $-\text{CCl}_3$  group.

Siegler and Gertler<sup>8</sup> have also reported that Methoxychlor has some considerable insecticidal activity. They prepared several compounds of the general formula,



where the substituted group R was  $-\text{Cl}$  (DDT),  $\text{OCH}_3$  (Methoxychlor),  $-\text{Br}$   $\text{CH}_3$ ,  $-\text{OCOCH}_3$ . All these compounds were made by the conventional method of condensing 1 mole of chloral hydrate and 2 moles of the required aryl compound (anisole in the case of Methoxychlor) in the presence of concentrated sulphuric acid.

Each compound was prepared for its application as a spray by first dissolving it in 95 per cent alcohol and then precipitating it with water, which was added to make a carrier containing 20 per cent of alcohol by volume. All compounds were used at the rate of 4 lb. to 100 gal. of the carrier.

The toxicity tests were made with the

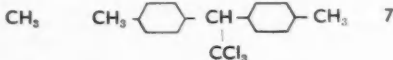
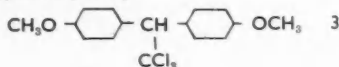
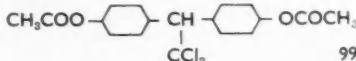
codling moth *Carpocapsa pomonella* larvae, using the apple plug method, one ready-to-match codling moth egg being used to test each of the new compounds, and 68 were used with DDT itself.

In the absence of any insecticide, 95 per cent of the apple plugs became wormy; when DDT was used, none became wormy and when Methoxychlor was used 3 per cent became wormy. It is evident that although, against the codling moth larva, Methoxychlor is not quite so effective as DDT, it is nevertheless very nearly so.

Results including those obtained with the other analogous compounds that were tested are as follows:—

Substituent Group R	Formula	Percentage apple plugs that become wormy
Nil	$\text{C}_6\text{H}_5-\text{CH}(\text{CCl}_3)-\text{C}_6\text{H}_5$	47
Cl (DDT)	$\text{Cl}-\text{C}_6\text{H}_4-\text{CH}(\text{CCl}_3)-\text{C}_6\text{H}_4-\text{Cl}$	0
Br	$\text{Br}-\text{C}_6\text{H}_4-\text{CH}(\text{CCl}_3)-\text{C}_6\text{H}_4-\text{Br}$	23

(formula continued overleaf)

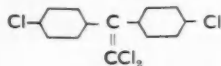
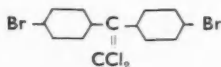
OCH<sub>3</sub> (Methoxychlor)OCOCH<sub>3</sub>

It is evident that the substitution of bromine in the aryl nuclei instead of chlorine (DDT) considerably reduces the efficacy of the insecticide. The methyl group, perhaps surprisingly, gives a quite toxic compound, although it has a distinctly lower toxicity than has Methoxychlor.

The presence of the acetoxy groups in the rings completely destroyed the toxicity; indeed the plugs treated with 2,2-bis (*p*-acetoxyphenyl)-1,1,1-trichloroethane had a higher percentage wormy than those that were untreated. If the aryl nuclei were unsubstituted then the compound had only a low toxicity.

In view of Martin and Wain's theory that the toxicity of DDT and related compounds is due to their ability to split off hydrogen chloride, it is of interest to note that Siegler and Gertler tried the effect of dehydrochlorinating some of their compounds. The results they obtained were as follows:—

Substance	Percentage of apple plugs Wormy
2, 2-bis ( <i>p</i> -chlorophenyl)-1,1,1-dichloroethylene	85

2, 2-bis (*p*-bromophenyl)-1, 1-dichloroethylene 86

These results show that the toxicity of the dehydrochlorinated bodies was very low and they support the views of Martin and Wain.

The main conclusion that can be drawn from the work of Siegler and Gertler is that when the substituents in the *para* position of the aryl groups are those that

will lend lipid solubility to the compound then the compound is toxic. There appears to be no specificity of the chlorine atom as a substituent in the aryl groups. Very likely, however, there is specificity of the chlorine atom in the  $-\text{CCl}_3$  group, although further work appears to be necessary to clarify this point.

It is clear, too, that of the substituent groups tried in the aryl nuclei, chlorine (DDT) and methoxy (Methoxychlor) appear to be the most powerful. The main defect of DDT, with its chlorine substitution, is its low power of knockdown, and against flying insects this is a considerable disadvantage. In attacking flying insects, Methoxychlor may well appear to hold an advantage over DDT, although against larvae DDT appears to have a rather higher toxicity.

#### Against Housefly

Prill, Hartell and Arthur<sup>7</sup> compared the insecticidal activity of some alkoxy analogues of DDT, using the housefly *Musca domestica* L as a test insect. They found that Methoxychlor (m.p. 89° C.) showed a surprisingly good knockdown, better in fact than did DDT itself.

Used in a concentration of 0.15 grams per 100 c.c. of Deo-Base, a refined petroleum distillate, it was not quite up to the required standard, but with 0.2 grams per 100 cc. it was very satisfactory. These lower concentrations gave poor kills (slightly lower than 0.25 grams DDT per 100 cc.) but 0.4 grams Methoxychlor per 100 cc. gave a good kill.

Tests were made by the large Peet-Grady method<sup>8</sup>; in each case the resistance of the culture was determined for each culture of flies by the official test insecticide (OTI), the purpose of this being to show up any significant differences in the resistance of one lot of flies from another. Results were as follows

	Concn. gm. per 100 cc.	Knockdown in 10 mins. per cent	Knocked down flies dead in 24 hrs. per cent of original number	OTI Kill in 24 hrs. per cent
DDT	0.25	42	38	49
Methoxychlor	0.15	91	31	51
"	0.20	99	32	34
"	0.40	99	85	46

Slow knockdown is a recognised defect<sup>9</sup> of DDT and Methoxychlor shows to very considerable advantage in this respect. On the other hand, most of the flies knocked down by DDT subsequently died, whereas in the case of Methoxychlor a large percentage recovered, except when a higher concentration was used. When

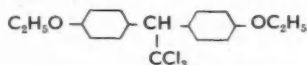
that was done and 0.4 grams per 100 cc. was used knockdown was excellent and the kill was very good.

These results suggested to Prill *et al* that the use of a mixture of DDT and Methoxychlor might possibly combine the advantages of both insecticides. When this was tried, results were as follows:

	Concn. gm. per 100 cc.	Knock- down in 10 mins. per cent	Knocked down flies dead in 24 hrs. per cent of original number	OTI Kill in 24 hrs. per cent
DDT + Methoxychlor 0.15	0.10	94	86	44

The knockdown and the kill with the mixture of 0.10 gm. DDT and 0.15 gm. Methoxychlor per 100 cc. are both very much better than with 0.25 gm. DDT per 100 cc.

The ethoxy analogue diphenethyl trichloroethane,



and the *n*-propoxy and *n*-butoxy analogues were also tried. They gave results as follows:

	Concn. gm. per 100 cc.	Knock- down in 10 mins. per cent	Knocked down flies dead in 24 hrs. per cent of original number	OTI Kill in 24 hrs. per cent
Ethoxy	0.20	90	86	34
Propoxy	Much inferior			
Butoxy	Much inferior			

The ethoxy analogue (m.p. 105° C.) at a concentration of 0.2 gm. per 100 cc. gave a good kill and a knockdown much better than that given by DDT, but not quite so good as that given by Methoxychlor. In respect of kill it was rather better than Methoxychlor. A mixture of the two alkoxy derivatives gave a good knockdown and a good kill.

	Concn. gm. per 100 c.c.	Knock- down in 10 mins. per cent	Knocked down flies dead in 24 hrs. per cent of original number	OTI Kill in 24 hrs. per cent
Methoxychlor 0.15				
Ethoxy analogue 0.15		97	88	44

It seems that the methoxy analogue, Methoxychlor, may have the best all-round properties, although it is closely approached in this respect by the ethoxy analogue. There is no doubt whatever that the knockdown effect of Methoxychlor is very markedly superior to that of DDT. Mixtures of DDT and Methoxychlor may have properties that excel those of either component separately. It

is even possible that a ternary mixture of DDT, Methoxychlor and the ethoxy analogue would be still better; on general biochemical grounds it would not be surprising if it were so.

These three insecticides were also tested against mosquito larvae (*Culex quinquefasciatus* Say) and concentration of 0.03 to 0.04 parts per million in tap water killed half the larvae in 20 hours. They were about equally effective.

Feeding tests on rats suggested that the ethoxy analogue may be less toxic than DDT to higher animals; by analogy it might be expected that Methoxychlor would also be less toxic than DDT, but that yet remains to be proved. The toxicity of DDT to higher animals was reported by Draize *et al.*<sup>10</sup>

These trials of Prill *et al* demonstrated clearly that Methoxychlor is an insecticide of the same order of effectiveness as DDT, that it has a much more rapid knockdown action, and that there is much to be said for its admixture with DDT.

The question of its use unmixed will doubtless have to await the results of more extended trials. The fact that its manufacture on a pilot plant scale has already been reported from America suggests that its potentialities are being considered very seriously. It is worth noting, however, that in another trial 0.10 gm. DDT and 0.05 gm. pyrethrins per 100 cc. gave results as good as 0.10 gm. DDT and 0.15 gm. Methoxychlor.

#### Manufacture

The production of Methoxychlor has been investigated by Schneller and Smith.<sup>11</sup> After an experimental investigation of the effect of several variables on the yield and quality of the product, they devised a pilot plant procedure. On its initial run, using the following quantities of materials:

	lb.
Chloral (including 2 per cent excess) "DDT grade"	877
Anisole, redistilled	974
Sulphuric acid, 66° B $\epsilon$	875
Carbon tetrachloride	1100
Sodium carbonate	120

a yield of 88.1 per cent of Methoxychlor was obtained; i.e., the yield was nearly 1400 lb.

The anisole and the chloral are mixed and the acid added slowly, to effect the condensation, with vigorous agitation. The reactor, which is of 300-gal. working capacity and is enamel-lined and jacketed and fitted with an anchor-type stirrer and equipped for distillation, is maintained by external cooling at 25 to 30° C.

With good mixing the reaction time is less than 1 hour. As the reaction approaches completion, the mass thickens

owing to incipient crystallisation, and the carbon tetrachloride is added in sufficient quantities to keep the mixture fluid enough to be stirred. Stirring is continued for 1 hour after the first addition of the carbon tetrachloride.

The reaction mixture is blown out of the reactor vessel into a tank containing 700 gal. of cold water and stirred. The supernatant aqueous acid layer is separated and rejected. The slurry is washed by stirring with hot water, allowed to separate and the aqueous layer decanted. The washing is repeated with the addition of sufficient sodium carbonate to neutralise the mixture.

The washed slurry is run back into the reactor and the carbon tetrachloride distilled from the slurry in the reactor vessel with steam. The Methoxychlor is run out of the still into containers in which it solidifies (setting point 69° C.). The solidified product is ready for use as "technical grade."

When purified, the product melts at about 88° C. It exhibits dimorphism, and a product melting about 78° C. has also been prepared; this readily changes into the higher melting form, but the reverse process cannot at present be brought about.

### Conclusions

Methoxychlor has been shown to have a toxicity as an insecticide of the same order as that of DDT. Against the codling moth it is nearly as good, and in a test prevented the development of the larvae of this insect in 97 cases out of each 100 tested. Lead arsenate, the traditional remedy for this pest, was successful to the extent of only 60 per cent.

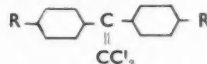
Against the housefly, Methoxychlor is very much superior to DDT in its knock-down effect. When used in concentrations of 0.2 per cent (wt./vol.) in a petroleum-derivative solvent it gives a very high knockdown of flies but appears not to kill them all. DDT has a much lower knockdown but a high percentage of those knocked down are in fact killed. If a 0.4 per cent (wt./vol.) solution of Methoxychlor is used, not only its knock-down, but also its "kill" is excellent.

Mixtures of DDT (40 per cent) and Methoxychlor (60 per cent) appear to be much more effective against flies than DDT alone, and probably better than Methoxychlor alone.

Its preparation presents no difficulty; it can be made by the condensation of anisole with chloral hydrate in the presence of sulphuric acid, a method exactly analogous to that used for manufacturing DDT from chlorobenzene and

chloral hydrate. The manufacture of Methoxychlor on a pilot plant scale has given yields approaching 90 per cent, a figure that would doubtless soon be passed if large-scale production was undertaken.

The insecticidal properties of other analogues of DDT, in which other groups replace the chlorine in the aryl nuclei, have been investigated. It appears that provided the substituent group is not highly polar, lipid solubility will be exhibited by the compound and it will show insecticidal properties. If, however, the substituent group is strongly polar ( $-OH$  or  $-OCOCH_3$ ) lipid solubility is low and no marked insecticidal properties are evident. It has been suggested that for toxicity to appear in this range of compounds to which the two insecticides belong there must be (1) lipid solubility (2) the ability to split off hydrogen chloride. While it has been clearly demonstrated that compounds such as DDT and Methoxychlor which are themselves highly toxic, give rise on the loss of hydrogen chloride to substituted dichlorethylenes of the type,



which are non-toxic or only slightly toxic, it cannot yet be said that this view is completely proved. For example, some workers have thought that the toxicity of DDT and its analogues is due to the anaesthetic action (nerve paralysis) of the  $-CCl_2$  group. The high activity of Methoxychlor makes it clear that the *p*-chlorophenyl groups of DDT have no specificity—probably their function is simply that of conferring lipid solubility on the product. A further advantage that Methoxychlor may have over DDT is that it seems likely to be less toxic to mammals.

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- <sup>8</sup> "Blue Book," p. 177, MacNair Dorland Co., N.Y. (1939).
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- <sup>10</sup> J. H. Drazice, G. Woodard, O. G. Fitzhugh, A. A. Nelson, R. B. Smith and H. O. Calvery, *Chem. Eng. News*, 22, 1503 (1944).
- <sup>11</sup> G. H. Schneller and G. B. L. Smith, *Ind. Eng. Chem.*, 41, 1027-29 (1949).

## CENTRIFUGAL MOULDING OF PLASTICS

### Formation of Asymmetrical Shapes in Plexiglas

A MASSIVE aerial centrifugal machine, named the Rotoformer, for shaping plastic canopies of the largest sizes for U.S. aircraft of all types, has been designed by scientists of the Goodyear Aircraft Corporation, Akron, Ohio, where it is now in use.

Shaping of aircraft canopies is accomplished by spinning the plastic material at high speed. Sheets of Plexiglas, the American equivalent of Perspex, heated to a soft, pliant state, are made to assume their final form by centrifugal force. This is believed to be the only known way in which optically clear plastic canopies can be made in shapes that do not conform in cross section to the arc of a perfect circle. The new process makes possible fabrications with cross sectional contours that are geometrically close to parabolic shapes, which permit them to be fitted into aircraft with maximum streamlining.

The new machine has a tubular steel rotating shaft, 8 in. in diameter and approximately 20 ft. long, from which is suspended a fixture in which the canopy is formed. The fixture is a retaining frame made to the exact dimensions of the aperture of the aircraft fuselage, and a protective covering to protect the plastic during the spinning process.

The plastic is held only by the part of the plastic sheet that ultimately becomes the mounting base of the canopy. This is secured with metal clamps. The rest of the sheet is free.

A protective cover is then placed over the assembly and the big drive shaft is



The girl standing inside the full-size plastic aircraft canopy holds a similar fitment for a small plane. Behind her is the Rotoformer centrifugal moulding machine.

electrically revolved to cause the plastic sheet to turn at high speed. The spinning is controlled until the plastic has been extended to the desired limits by centrifugal force and is continued until it has cooled and set. The final contour, over the top centreline, must conform to a plus or minus tolerance of within a fraction of an inch.

## COLOURED ASPHALT IS UNDERGOING ROAD TESTS

EXPERIMENTS carried out by the Road Research Laboratory, Department of Scientific and Industrial Research, have produced asphalt in colours such as cream, yellow, red, green and blue at a cost not very much greater than that of ordinary asphalt.

The DSIR report states that coloured asphalts made from pigmented "albino" bitumens have been used for many years, but they are much more costly than ordinary asphalt. Only dark shades can be produced because of the intrinsic darkness of the bitumen.

The new bright colours are made by using a proprietary brand of resinous binder known as "Cados." It is more

translucent than albino bitumen. Using this binder and a clean white aggregate such as calcined flint it is possible to obtain a fine white asphalt which can be easily coloured with any desired pigment. The addition of 4 per cent of titanium oxide, for instance, gives a creamy white. Effective reds and yellows, greens and blues have been made with as little as 2 per cent of other pigments.

The materials have not yet been tested under traffic, but a small area in four colours at the laboratory is giving promising results. Trial areas on roads and footpaths are being planned and the results of large-scale trials on public roads should be available in a few months.

## Widening Range of Rubber Uses

### Holland Simplifies the Transparent Film Process

**N**EW uses for rubber in spheres usually covered by plastics have recently come to light. In this connection, a new industry is being established in Holland, based on natural rubber and hydrochloric acid. The Rubber-Stichting, Delft (Rubber Foundation), which is associated through the International Rubber Development Committee with similar organisations in Great Britain and France, has developed the new material and has applied for patents in all the important countries of the world. The Stork concern at Hengelo in Holland is one of the first licensees.

Prior to the war rubber hydrochloride (Pliofilm) was manufactured in America, and is now being made in England and is applied, among other things, for packing purposes, especially in instances where water-clear transparency and a very low moisture permeability are required. (THE CHEMICAL AGE, 60, 271, 370, 618.)

Contrasting with the American method, the new process and equipment are extremely simple, so that an industry having hydrochloric acid available can manufacture at low capital cost.

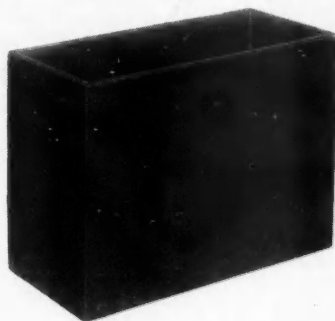
During recent years natural rubber has felt competition not only from synthetic rubbers but also from plastics. By the effect of the new process—the result of a very long and intensive laboratory research—natural rubber growers can hope to recover part of their market in this competitive field.

A more detailed description of the new process is being issued shortly by the British Rubber Development Board.

#### Ebonite Vessels

Another example of the use of rubber in unaccustomed rôles is in the solution of the difficult problem of storage of corrosive chemicals (solid and liquid), now being used increasingly in many industries.

There are not many materials which can be used with safety to contain such chemicals. The announcement by Lorival Plastics of the manufacture of ebonite tanks for this purpose is therefore interesting. These containers, manufactured from chemically resistant hard rubber, are at present made in two sizes. The smaller is 14 in. high, 11 in. wide and 19 in. long, with a wall thickness of 5/16 in. and weighs 19 lb.; it has a capacity of 10 gal.



[By Courtesy of Lorival Plastics, Ltd.]

*The new chemically resistant ebonite tank, holding 20 gal.*

The larger, with a capacity of 20 gal., is 20 in. high, 11 in. wide and 27 in. long, with a wall thickness of  $\frac{1}{2}$  in.; it weighs 42 lb.

Many hundreds of containers made from similar material were used during the war by the armed forces as chlorination tanks for purifying water supply. Their usefulness in chemical plant is visualised also in the manufacture of photographic materials, in laundries, to hold agricultural insecticide materials, for dyeing and cleaning liquids, in tanneries and paper factories, in plating works and research laboratories. The tanks, with strong walls, are sufficiently stable to need no special stand and are relatively inexpensive.

#### Institute of Welding

THE annual report of the council of the Institute of Welding for the year ended March 31, presented at its recent annual general meeting in London, revealed an increase in membership, 4818 against 4631 in the previous year.

The growth of branches, both in activity and in number, continued throughout the year. Council recognition was accorded to a new section at Hull, under the Leeds branch, and to the first overseas branch, in India. Inquiries have been received with a view to the formation of a section of the South London branch to serve the Medway area.



## CHEMICAL PROSPECTS IN CHINA

### *Foreign Capital and Technicians will be Needed*

**C**URRENT conditions in China are thought likely to result eventually in enlarged demand for imported chemicals and for foreign capital and technical men particularly to assist in re-establishing and developing the basic chemical industries. An era of peace is, of course, the greatest immediate need. The people are mostly peaceful and industrious, and the land has vast natural resources that could form the basis of a large and flourishing chemical industry.

A recent report by the U.S. Department of Commerce, relating mainly to territory which was then under control of the Nankin government indicates that despite the acute difficulties engendered by Japanese and Communist aggression, chemical industry had to some extent held its ground and even developed with the assistance of UNRRA. Japanese occupation, moreover, was not wholly destructive.

#### **Advances in the North**

In Manchuria, especially, since it came under Japanese control, some progress has been made in various directions including chemical manufacture. The Japanese, in fact, extended some factories and established new ones. In December, 1941, this extension programme was accelerated, and, during 1943-4, chemical industry in northern China reached a relatively high level.

In 1947 the Commission on National Resources (CNR), which was appointed in 1935, concentrated its attention on key industries, and in 1948 it directly controlled 13 factories and exercised some sort of advisory supervision over others.

#### **Lack of Coal and Power**

One of the chief centres of chemical industry in China is Shanghai, where, of some 200 factories engaged before the war about 77 were working in 1947 and covered 60-80 per cent of the total demand for chemical goods. In the city and surrounding district there was also, in 1947, considerable production of chemical raw materials and pharmaceuticals, but owing to lack of coal, electric power, and transport difficulties, production has perforce largely to be diminished.

The same applies to other large industrial centres: Tientsin, Hankow, Tsingtao, Canton.

The organic chemical industry is little developed but has large possibilities.

Alcohol is manufactured in considerable quantities—about 10 million gal. per annum. Of the dyes, aniline black is about the only one produced from coal tar; the necessary basic industry, coke and gas, is largely lacking. What organic chemical industry there is has been centred mainly in the Shanghai district.

The average monthly production in 1946 of the soap industry of Shanghai was 140,000 cases, 180,000 in 1947, and estimated at 200,000 in 1948. Capacity could easily be raised to 500,000. There is serious lack of caustic soda. Tung oil is one of China's leading natural resources. The abrasin, or tung tree, is widely distributed, among the principal centres being the provinces of Czechuan, Hunan, Houpa, and Kowchow. Attempts are being made to restore the industry to an annual output of at least 180,000 tons, of which two-thirds would be for export.

#### **German Technical Reports**

THE Board of Trade announces that the following reports on German industries, although considered unsuitable for publication, may be inspected at the TIDU offices, 40 Cadogan Square, S.W.1:—

FD 3276/48. Some remarks on design and manufacture of optical instruments in Western Germany.

FD 1011/49. Insecticides and fungicides at the I.G. Farbenindustrie plant, Höchst.

FD 1013/49. Manufacture of torula food yeast from sulphite liquors.

FD 1030/49. Staple fibre (spinning) at Thüringsche Zellwolle, A.G. Schwarzau.

#### **Next Week's Events**

**MONDAY, JULY 25**

**Royal Institute of Chemistry**

St. Andrews: University (until July 30) symposium: "Recent Advances in the Fermentation Industries."

**TUESDAY, JULY 26**

**Parliamentary and Scientific Committee**

London: House of Commons, Committee Room 12, 5 p.m. To consider interim report of the sub committee on development of backward areas under President Truman's "Fourth Point." Dr. W. K. Slater, secretary of the Agricultural Research Council: "The Work and Plans of the Agricultural Research Council."

## PARLIAMENTARY TOPICS

*Ending Fertiliser Subsidies*

THE intention to withdraw the Government subsidy on agricultural fertilisers was disclosed in the House of Commons this week by the Minister of Agriculture (Mr. Tom Williams). He said, in reply to Mr. G. Jeger, that the present price system had ruled since October, 1940, and no change was proposed during the year July 1, 1949, to June 30, 1950. However, it was intended thereafter that the subsidy on agricultural fertilisers should be withdrawn in two approximately equal stages, during the fertiliser years 1950-51 and 1951-52. The increase in cost would be taken into account in the annual price review of agricultural products.

REPLYING to a question by Sir F. Sanderson, in the House of Commons last week, Mr. J. Freeman said the Ministry of Supply's stocks of virgin copper, including stocks abroad and afloat, amounted to approximately 170,000 tons on June 30. It was estimated that a further 150,000 tons would be delivered under our present commitments which extend to the end of 1949, but which were not all covered by contracts with definite terminal dates. Owing to the large number of separate transactions and to other factors, such as charges for refining blister and rough copper and scrap, an average price would have no significance, but the greater part of the copper already delivered was bought at a price related to the New York export price of £130 12s. 5d. a ton. Some of the copper yet to be delivered was bought at a price related to this price and some at prices related to the lower prices prevailing since March 29. Prices for the remainder had yet to be fixed. The present New York export price was £97 19s. 4d. a ton f.a.s.

A QUESTION by Mr. A. R. Blackburn, to the Lord President of the Council, drew from Mr. H. Morrison the reply that research aimed at finding effective new substances akin to compound E in the treatment of rheumatic diseases was in active progress under the Medical Research Council. He was advised that these compounds were difficult to make and early success was not to be expected.

MR. J. FREEMAN said the "very heavy losses" alleged by Mr. Winston Churchill and others to have been made to date on stocks of copper, lead and zinc "amounted to a profit of about £6 million."

## SCIENCE IN INDUSTRY

*Practical Demonstrations for R.I.C.*

AMONG the many facilities offered to its members by the Royal Institute of Chemistry is the opportunity to see for themselves the practical application of science in various industrial activities by the organisation of tours and visits to factories, laboratories and works.

Two visits recently organised by the London and South Eastern Counties section were well attended and again proved of great practical value.

During the visit to the British Oxygen Co., Ltd.'s works at Cricklewood, the party watched demonstrations of welding, oxyacetylene cutting and saw a colour film showing applications of oxyacetylene flames.

The elimination of oxygen from the point where a joint is being welded may be effected by means of the volatile products from a combustible coating on the rod of the welding metal, or by a refractory powder, or by a stream of argon and craftsmen demonstrated the welding of steel, copper and aluminium and the brazing of brass by one or more of such techniques employing electric arcs of flames of carefully chosen characteristics.

In contrast it was interesting to see an oxyacetylene flame cut through thick slabs of mild steel and cast iron with an ease almost comparable to that of cutting hard butter with a warm knife, and the perforation of a foot-thick block of steel with the "oxygen lance" in less than a minute.

A tour of the factory of Pharmaceutical Specialities, Ltd. (May and Baker, Ltd.), Dagenham, was greatly appreciated by the visitors.

The divisions open for inspection were the pharmaceutical laboratory, where the preliminary formulating and small scale preparations are carried out; the chemotherapeutic research laboratory, where new substances are synthesised and tested; the technical development laboratories, which take over promising substances from the research laboratories and deal with the pilot or semi-scale stage; various processes in the works including the preparation of iodides, hydrobromic acid, mercurials, aromatics and the ether plant; the pharmaceutical preparation and packing division where the preparation of tablets and the filling and sealing of ampoules were demonstrated; finally the analytical control laboratories.



## Technical Publications

**P**RECISION electrical apparatus is being increasingly used in a variety of chemical and physical applications. A wide variety of testing equipment—signal generators, impedance bridges, high and low range ohmmeters, and many other instruments—are listed in the latest catalogue and price list now available from Taylor Electrical Instruments, Ltd., Slough.

\* \* \*

THE properties of titanium dioxide as ceramic material for electro-technical purposes, and methods for reducing the high negative temperature coefficient of pure  $\text{TiO}_2$  to zero by means of suitable admixtures are the subject of an article by E. J. W. Verwey and R. D. Bügel in the current issue of Philips Technical Review (Vol. 10, No. 8; Philips Electrical, Ltd.).

\* \* \*

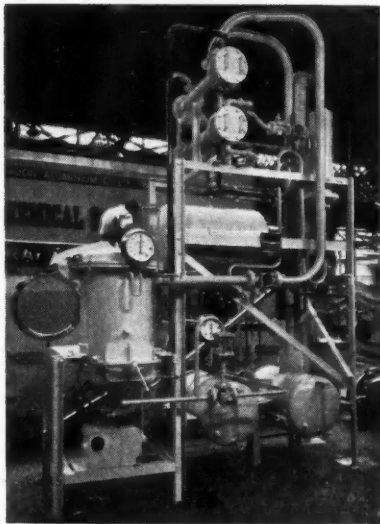
THE importance of research in the petroleum industry is outlined in an article in the first issue of the new Esso magazine for June, which states that the Standard Oil Co. (N.J.) invests \$20 million annually to maintain the development of new products. The magazine contains a wide variety of articles and is excellently produced and illustrated.

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AMONG the many interesting features in the current issue of *Endeavour* (July, 8, 31), is an article on high-polymer molecules in solution, by A. R. Miller, who returned to Cambridge after the war as an I.C.I. Fellow and is now working at the Royal Society Mond laboratory on problems of low-temperature physics. Other articles deal with nitrogen metabolism in plants; science in the detection of crime; flight at supersonic speed, scientific education in U.S.A. The colour reproductions of the garden at Tresco, Scilly Islands, and specimens of decay of timber are of the usual high quality associated with this publication.

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THE uses of the photoelectric spectrophotometer as a powerful new instrument for analysis and research lend interest to the first issue of the "Bulletin of the Photoelectric Spectrometry Group." The inaugural meeting of the group, which now has 130 members, is reported, as are the papers read, and there is an article describing a preliminary collaborative test on aqueous potassium nitrate.



A complete Merz system pilot plant for solvent extraction recently fabricated by the London Aluminium Co., Ltd., Birmingham, and shipped to India on behalf of the Department of Chemical Technology, Bombay

METHODS of increasing the efficiency of milling operations at one of the largest U.S. ore-treatment plants at Cardin, Okla., are described in Report 4511 of the Bureau of Mines. Results of the study show that the recovery of zinc minerals could be substantially increased by improving some operating conditions and that, by applying the sink-float treatment to certain types of jig feed, the loss of zinc in industrial wastes could be reduced by approximately 50 per cent. The investigation also indicated that the crushing and wet grinding of ferrosilicon are commercially feasible.

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UNDER the title "Smoke Inspectors' Case-Book" some characteristic examples are given of cases investigated by the National Smoke Abatement Society and recorded in the summer issue of "Smokeless Air," the journal of the society. There are also a number of excellent photographs.

# The Chemist's Bookshelf



THE BASIS OF CHEMOTHERAPY. T. S. and E. Work. 1949. London: Oliver & Boyd. Pp. 435. 26s.

Reference to any of the journals devoted to organic chemistry, either in this country or abroad, will inevitably show that a large proportion of present-day work is devoted to experiments designed to produce new drugs for malaria and other diseases. In this connection we are reminded of the work of Ehrlich, who may be designated as the father of modern chemotherapy, his first experiments in this branch of science having been carried out in 1891. This science is concerned with elucidating the reasons why certain drugs behave as they do against various organisms. It is not until we know the way in which drugs act that we can develop a logical programme of research in an attempt to make more effective drugs. The theoretical developments in the present volume provide no easy method to the production of new chemotherapeutic drugs, but are an endeavour to provide a logical cause for the whole subject.

Although the therapeutic use of any chemical might be regarded as chemotherapy, it is usual, in practice, to restrict the meaning of the term to the chemical treatment of diseases of microbial origin with a view to eliminating the microbial infection. It is in this sense that the term is employed in this book. After an historical introduction, the book is divided into six chapters dealing with those aspects of drugs and their action which, when integrated, throw some light on the science of chemotherapy as a whole. The first of these chapters is concerned with cell metabolism, including carbohydrate and protein synthesis, and is followed by one on essential metabolites. The antagonism of sulphonamides for para-aminobenzoic acid and related topics are fully discussed. Drug resistance is playing an increasingly large part in the practical difficulties associated with the clinical control of infection, it having been

found that sulphonamides give rise to resistant strains of bacteria as do penicillin and streptomycin. The concluding chapter deals with the relation of structure of drug molecules to their activity, and in order to obtain a clearer picture of these variations, the effect of altering the structure is considered under three heads: the change in distribution, the alteration in *in-vitro* action of the drugs, and factors affecting the interaction of drugs with enzymes.

Chemotherapy being a hybrid science, its workers are drawn from many of the pure sciences, such as chemistry and biology. Until now there has been no one book to which they could go for general information on this new science which would serve as an introduction to the subject. The authors in their preface say: "If this book does something to focus attention upon the modes of action of drugs rather than upon the synthesis of ever more variants on their chemical structure, it will, to some extent, have fulfilled its purpose." Because this book covers a wide and over-lapping field, some of the material may seem elementary to a specialist in any given section. The text is clearly written and freely illustrated with diagrams and tables.

A TEXTBOOK OF THEORETICAL AND INORGANIC CHEMISTRY. Philbrick and Holmyard, revised in collaboration with W. G. Palmer. 1949. London: J. M. Dent & Sons, Ltd. Pp. 854. 18s. 6d.

It is a pleasure to welcome a revised edition of this well-known book, which made its first appearance in 1932. The text is designed for university entrance scholarship and degree examinations and is divided into three parts. The first is an historical introduction, which is followed by a study of general and theoretical chemistry, and the third part is a systematic account of the elements and their compounds. It is in the second part that the most substantial revisions have been made, and accounts of the transuranic elements and of the theory of valency are included. One of the merits of the third part is that the so-called rare metals such as vanadium, titanium and tungsten are treated thoroughly and not relegated to a few lines of small type. The inclusion of a most adequate index will enable this volume to be used as a small reference volume or as a students' textbook.

## AMERICAN CHEMICAL NOTEBOOK

From OUR NEW YORK CORRESPONDENT

THE organisation of this year's 22nd Exposition of Chemical Industries has been planned on a scale rivalling any previous enterprise. It will be held in the Grand Central Palace, New York City, during November 28—December 3. All available space on the Palace's four floors will be required. Exhibits will be composed of raw materials, machinery and products covering every recognised industrial and commercial application of chemical materials, from medicinal preparations and foodstuffs to such things as paper, plastics, dyes, and related chemical products. The 50,000 visitors at the last of these displays, held in 1947, represented nearly 60 different industrial groups. E. R. Weidlein, director of the Mellon Institute, is chairman of the advisory committee, composed of leaders in the major fields of interest which the exhibitors represent.

\* \* \*

Improving upon a process developed by the U.S. Bureau of Entomology and Plant Quarantine, announced several months ago, the synthesis of pyrethrum-like esters has been achieved in the Jersey City laboratories of S. B. Penick & Company, New York, one of the world's largest botanical drug houses. Pyrethrum, naturally obtained from flowers from East Africa, is a basic insecticide and has long been regarded as the least toxic. Preliminary tests on flies indicate the synthetic material to be equal in toxicity to the natural. Further technical work remains to be done, but the new compound is now being made in limited quantities. It is found that in addition to the known active principles, pyrethrin I and II, there were two other principles, cinerin I and II. The new synthetic is referred to as the allyl homologue of cinerin I. It is hoped that eventually the domestic production of synthetic pyrethrum will make the U.S.A. independent of foreign sources of supply.

\* \* \*

Amberlite IRA-400, a new, strongly basic anion exchanger which is said markedly to increase the scope of ion exchange technology, has reached full plant-scale production. It is described as the first resin absorbent which can be used to split neutral salts completely, to convert salts to the corresponding free

bases of the metallic ions. One of its important contributions is the direct removal of silica from boiler feed. It will absorb negatively charged ions from acid, neutral, and even mildly alkaline solutions in a pH range from 1 to 10. The exchanger behaves as solid caustic with only its hydroxyl ions in solution. Its reaction as a strongly dissociated base largely explains its marked exchange rate, found to be far greater than other anion exchangers. This rapid rate of exchange is regarded as a very desirable feature where "batch" techniques are practicable. Thus it offers new opportunities for ion exchange methods in applications apart from water conditioning. For example, it is said to absorb all amino acids with isoelectric points below pH 10, and in ash removal operations it is capable of eliminating the anionic impurities first, a reversal of the usual de-ionisation procedure. The resin can be mixed intimately with strong cation exchanger to prepare a bed that will completely de-ionise solutions in one column and in one step, state the makers the Rohm & Haas Company.

\* \* \*

A new catalogue (No. 3) listing translations of 91 Russian scientific papers is now available from the Research Information Service, 509 Fifth Avenue, New York City, translators of foreign technical data. The fields of science and technology covered by the translations include biophysics, ceramics and glass, chemical warfare, inorganic chemistry, organic chemistry, physical chemistry, crystallography, drugs and insecticides.

\* \* \*

The first edition of the international "Who's Who in Plastics" has just been published by the Society of the Plastics Industry, Inc. In its biographical section are the names of 2989 individuals, their present and past affiliations, position in each case, and educational background. The company section lists company name and address, key officers, company products, and methods of manufacture. The book provides data about companies located in the U.S.A., Canada, the United Kingdom, Europe, South America, India, Australia, and China. It is being distributed by the Society of The Plastics Industry, Inc., 295 Madison Avenue, New York 17, N.Y. (\$5.50).

## ACID RESISTANT CEMENT

### Norway Studying Calcite

**C**ALCITE, a limestone ( $\text{CaCO}_3$ ) which appears to confer on concrete unusual water and acid-resistant qualities, may in time become a significant export item of Norway, according to the Norwegian Information Service, New York.

The Norwegian engineer, Arne Daniels, of the Vaagsoy Cement Works in Sunnmøre, recently presented results of a series of tests to an assembly of fellow-specialists in Oslo. According to these, four parts of cement to one part of calcite mixed into concrete, form a building material highly resistant to salt water, weather and acids.

Several years ago, while examining concrete installations in the tide-water section near Vaagsoy, Daniels noted that a cement dock, built in 1913, showed no indications of water action. Further investigation proved that the fisherman who built it had unknowingly mixed calcite into the concrete.

During the past two years, a series of laboratory experiments have indicated that calcite may in reality be the key to a highly efficient constructional material. Whether the new ingredient will, for example, make it possible to use calcite-concrete instead of glazed tile pipe in acid soil, or to effect other savings in increased durability of dams, wharves, and exposed structures, will depend upon results of practical tests extending over a period of years.

## Aromas and Textiles

**THE** peculiarly pleasant smoky peat smell, the distinguishing characteristic of genuine Harris and Irish tweeds, has inspired wool interests in both Australia and South Africa to seek some imparted synthetic aroma which may reveal the origin of clothing and blankets made from national wool.

Intensive research has been sponsored in both countries and chemists in Melbourne and Johannesburg are trying to devise an odour which will not wash out, will be lasting, cheap, not disliked by anyone, and, as far as possible, may be characteristic of the country as a whole.

In Johannesburg advanced tests have been made with a veld-fire aroma, the nearest equivalent to the smouldering peat smell. It is reported to withstand washings, and cost of treating a blanket is said to be only one-tenth of a penny.

## INDIAN RESEARCH

### New Dyes and Fuel Oils

**A**MONG the chemical research work recently carried out in the laboratories of the Presidency College, Madras, under a scheme of research financed by the Indian Government's Council of Scientific and Industrial Research, a valuable intermediate required for the production of photographic developers of the Amidol, Diamol and Dolmi class, and of dyes employed in the dyeing of furs and hair, (2,4-Diaminophenol) has been obtained in good quantities by the electrolytic reduction of m-dinitrobenzene. This is carried out in sulphuric acid emulsion using a copper or monel cathode and a lead anode in the presence of mercuric and ceric sulphates. In simplicity and economy of operation, and low upkeep charges, the process is believed to be superior to the other known processes.

Investigations carried out under the auspices of the CSIR have shown that most of the Indian vegetable oils can be successfully employed as diesel fuels. Cotton seed oil, in particular, gives exceptional performance in that its consumption is definitely less than that of mineral oils. Despite their good performance, however, vegetable oils cannot compete on a price basis with mineral fuels.

If the vegetable oils could be used as a vehicle for powdered solid fuel, the result would be economically more attractive and the oils might be able to compete with mineral oils. This possibility has, in fact, been tested in the laboratories of the CSIR. The results have shown that, with the use of a stabiliser prepared from the vegetable oil itself, colloidal fuels containing as much as 35 per cent by weight of charcoal can be prepared and stored for long periods without the charcoal settling out.

Provided the injection system is replaced to suit the new fuel, it has been found that a thermal efficiency approaching that of groundnut oil can be attained, the charcoal part being burnt as efficiently as oil itself.

### More Bauxite in Dutch Guiana

New deposits of bauxite are reported to have been discovered in the Nassau mountains in the southern region of Surinam, which is already one of the world's leading producers. The quality of the ore in the new find is claimed to be better than that previously exploited there.

# HOME

## Expansion

Industrial Gases, Ltd., is erecting new works premises at Richmond Road, Trafford Park, Urmston.

## Profits Shared

Manual workers of the Nuffield organisation are being given a share of profits based on the 1948 dividend, totalling £116,865. A total of £1,324,388 has been distributed since 1936.

## Refined Oils and Fats

The Minister of Food announces that no change will be made in the prices of refined oils and imported edible animal fats allocated to primary wholesalers and large trade users, during the eight-week period ending September 10.

## Coal Production

Britain's total coal output last week increased by 135,300 tons. Comparative figures are:—Last week: 4,179,900 tons (deep-mined 3,886,100 tons, opencast 293,800 tons); previous week 4,044,600 tons (deep-mined 3,756,200 tons, opencast 288,400 tons).

## Steel Research Centre

A site in Burnt Tree Lane, Sheffield, has been selected by the British Iron and Steel Research Association for the erection of a new research centre. This is the first station to be designed and built specially for the association since its foundation by the British Iron and Steel Federation in 1945.

## Training of Supervisors

The Institute of Industrial Supervisors, of which Sir Percy Mills is the first president, has set up an educational advisory panel of administrators, supervisors and foremen, to improve efficiency and provide information. Mr. Michael Clapham (Metals Division, personnel director, I.C.I., Ltd.) is one of its members.

## Successful Dust Suppression

It has been reported to the North Wales District Committee of the Welsh Board for Industry that experiments in dust suppression recently undertaken at several North Wales slate quarries are regarded as being successful. In process sheds with doors and windows closed, the air contained a concentration of 2000 dust particles per c.c. With suppression apparatus—a suction device above and beneath the cutting edge of the saw—the number of particles of dust was almost instantaneously reduced to less than 100 per c.c.

## Stanlow Ceremony Postponed

The Shell Petroleum Company has postponed the official opening of the £4 million plant at Stanlow on July 20 because of the proclamation of a state of emergency. The plant was to have been opened by Sir Stafford Cripps.

## Scottish Holidays

Most chemical plants in Glasgow closed down on July 15 and will be out of action for either one or two weeks. The majority of firms have made special arrangements for emergency needs, but the general policy has been to complete holidays within one period rather than "stagger" and continue understaffed.

## Workers' Portraits

At a gathering at Stevenston, Ayrshire, recently, five members of the staff of the Nobel Division of I.C.I. received portraits which were painted as part of the I.C.I. publicity campaign, "Portraits of Industry." The five Nobel Division workers will retain their portraits as permanent mementoes of their service with I.C.I.

## Belgian Farmers' Visit

A party of 20 Belgian farmers from the province of Namur was recently conducted on a three-day study tour of English farms by Mr. B. R. Crocker, of the Vizgol Oil Co., Ltd. The trip was the outcome of an invitation issued when Mr. Crocker took a party of young British farmers to Belgium earlier in the year.

## New Tar Distilling Plant

Scottish Tar Distillers, Ltd., are to erect at Falkirk a modernised distilling plant at a cost of about £19,290. Approval for the work has been given at the Falkirk Dean of Guild Court. The Scottish tar distilling industry made a notable contribution of essential raw materials throughout the war and deferred modernisation of the industry's plant is now being systematically effected.

## Firm's Record Steel Output

A new record of output has been reached by the United Steel Companies, Ltd., which produced 2,042,056 tons of steel ingots in the year ended June 30. This exceeded its target (2 million tons) and was also 146,000 tons higher than the record of the previous year. In a tribute to the employees of the firm at Sheffield, Rotherham, Scunthorpe and Workington, Mr. A. J. Peech, assistant managing director, said it was also a reward for the policy of modernising the plant.

## OVERSEAS

### Swiss Chromium Salts

A new plant for the production of chromium salts—principally sodium bichromate and chromic acid—has been installed by Gavaleron, A.G., Lugano.

### Bolivian Tungsten Exports

Exports of tungsten ore from Bolivia in the first quarter of 1949 declined 21 per cent from the preceding quarter, totalling 610 short tons (60 per cent  $WO_3$ ). Shipments during the corresponding period of 1948 amounted to 604 tons. During the first quarter of 1949, 98 per cent of tungsten exports was shipped to the U.S.A. and 2 per cent to the United Kingdom.

### Oil Equipment Abandoned

A recent announcement by the Burmah Oil Company states that several million pounds' worth of equipment is being abandoned at the Central Burma oilfields of Yenaugyaung. The company has been forced to discontinue reconstruction work because of rebel activities. The British-owned Burmah Oil, Indo-Burma Petroleum, and British-Burma Petroleum companies are included in the withdrawal and are expected to move to Chauk, another oil town, 40 miles to the north.

### Czech Products for U.S.A.

The Czech chemical process industries are stated to be exporting to the U.S.A. a number of products which were not formerly supplied, notably dental products, artificial leather, impregnated paper for packaging, cellophane and Vistra, an artificial fibre made from wood. Purchases from the U.S.A. will include crude oil, resins, dyes, asphalt, monazite, papaverine, pentaerythritol, etc. In 1943 such sales to America accounted for \$20 million; \$30 million worth of goods purchased from the U.S.A.

### Proposed State Fertiliser Plant

The Icelandic Parliament has authorised the Government to construct and operate a nitrogen fertiliser plant, with a production capacity of 5000 to 10,000 metric tons annually, to cost approximately the equivalent of £1.75 million. The factory is to be under the control of a board of directors elected by the Parliament. The Icelandic Treasury will finance the original cost of construction. The plant is one of the projects in Iceland's long-term development programme, and is expected to take several years to complete.

### Italian Oil Find

A further supply of oil is reported to have been tapped at Cortemaggiore in the Po valley. The new drilling is about 400 yards from the find reported last month, and is said to have started gushing when the drill reached a little less than 5000 ft.

### Cellulose Acetate in Australia

A new undertaking to produce commercially cellulose acetate is to be undertaken by Colonial Sugar Refining Chemicals. The company's capital is stated to be £A3 million, and its factory, which will produce a number of chemicals not before made in Australia, is at Rhodes (N.S.W.).

### Italian Lead and Zinc

Production of lead and zinc in Italy in 1949 is expected to reach the 1938 level, which was 32,770 tons of lead and 33,400 tons of zinc. Annual capacity of the zinc factories is now 44,000 tons, but shortage of power limits production. A long-term European aid plan envisages, for 1952 or 1953, the completion of a new electrolytic plant with an annual capacity for 9000 tons of zinc, and the extension of three existing plants.

### Increased Oil Charges

The terms of the agreement reached by the Iranian government and the Anglo-Iranian Oil Company revealed in Teheran this week provides that the royalty on all oil raised since 1947 shall be 6s. per ton (instead of 4s.), in accordance with which the company will be required at once to pay £8.36 million. The excise charge on oil is also raised from 9d. to 1s. per ton, requiring a further £600,000 for 1948. The company has also to pay 20 per cent of profits before deduction of British income tax. That change requires a further £5 million in respect of 1948.

### New S. African Asbestos Mine

A new mine is reported to have been started about 10 miles north of Krugersdorp in the Witwatersrand, where it is believed rich veins of chrysotile occur. The operating company possesses options over about 1400 acres.

### Canadian Rubber Record

Products of the Canadian rubber industry in 1947 have been valued at the record figure of \$193,908,000. Sixty plants, with a total of 23,475 employees, were in operation during the year, and over 82 per cent of the entire output was from Ontario.



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## • PERSONAL •

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MR. J. P. POSTLETHWAITE and MR. F. L. WARING, following their recent appointment as joint managing directors of the three subsidiary companies of Coalite & Chemical Products, Ltd. (THE CHEMICAL AGE, 60, 766), have now also been made joint managing directors of the parent company, by which they have assumed full responsibility for the whole of the Coalite group.

MR. CECIL JOHN TAYLOR, a manufacturing chemist, of West Newton, near Carlisle, a prominent member of the Carlisle City Council, is the prospective Labour candidate for the new Penrith and Border Division of Cumberland. He was the Independent candidate for the Rusholme Division of Manchester in 1944. Earlier that year he was a prospective Independent candidate for Attercliffe, Sheffield, but arrived too late on the nomination day.

DR. H. W. B. SKINNER, deputy chief scientific officer in charge of the general physics division at the Atomic Energy Research Establishment, Harwell, has been appointed to the Lyon Jones chair of physics at Liverpool University. He succeeds SIR JAMES CHADWICK, the distinguished atomic scientist, who takes up an appointment as Master of Gonville and Caius College, Cambridge, in October.

MR. JOHN GREEN, director of Thomas Firth and John Brown, Ltd., and MR. JOHN JAMES, chairman of the Lancashire Steel Corporation, Ltd., were among those who received from the King the accolade of Knight Bachelor at an investiture at Buckingham Palace last week.

MR. B. W. SILVERWOOD has recently been appointed technical commercial welding engineer to the Industrial Department of Philips Electrical, Ltd. Mr. Silverwood was recently elected secretary of the North London branch of the Institute of Welding in place of the late Dr. E. Sharratt.

SIR ALAN SAUNDERS has been selected to succeed SIR FRANCIS HUMPHREYS as chairman of the British Sugar Corporation, Ltd., with effect from August 1.

MR. H. SOWERBY, science master at New Mills Grammar School, Manchester, is to take up an appointment with the Atomic Energy Commission.



Mr. O. V. S. Bulleid, recently elected president of the Institute of Welding

DR. F. R. TUBBS, who has been appointed director of the East Malling Research station in succession to Sir Ronald Hatton, took up his duties on July 1. Dr. Tubbs, who is 41, has carried out extensive investigations in Ceylon for the Tea Research Institute. Since 1948 he has been manager in charge of the horticultural division of the food research organisation of Lever Bros., and Unilever, Ltd., at Sharnbrook, Bedfordshire.

On passing the examination for the Fellowship of the Royal Institute of Chemistry, MR. A. A. REA, of the technical division concerned with Dunlop special products, Fort Dunlop, has been awarded £20 under the company's education scheme.

MR. H. G. WELBERGEN is retiring from the position of general manager of Lumina Shell. He has been 31 years with Shell, 22 of which have been spent in Switzerland.

MR. A. E. YOUNG has been appointed managing director of the Glasgow Methyllating Co., Ltd., of Glasgow and London.

### Obituary

The death has occurred in France, at the age of 47, of MR. FRANK VAN ZWANENBERG, chairman of Organon Laboratories, Ltd., London, and Newhouse, Lanark.

The death was reported last week from Vienna of PROFESSOR OTTO CZADEK, aged 76, a well-known authority on food chemistry.



## Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

### Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an \*—followed by the date of the Summary, but such total may have been reduced.)

**BRITISH LIGNITE PRODUCTS, LTD.,** Bovey Tracey. (M., 23/7/49.) June 20, £5000 debenture, to Swithins Investment Trust Co., Ltd.; general charge. \*Nil. Dec. 7, 1948.

**DURHAM CHEMICALS, LTD.** (formerly NEWCASTLE-UPON-TYNE ZINC OXIDE CO., LTD., & OUSEBURN TRADING CO., LTD.), Sunderland. (M., 23/7/49.) June 20, £809 14/2 mortgage, to Percy Building Society; charged on 4/6 Mitchell Street, Bittley. \*£65,938. April 7, 1948.

**F. H. STEELE & CO., LTD.,** Dublin, manufacturing chemists, etc. (M., 23/7/49.) May 23, £10,000 debenture; charged on 22 Brookfield Avenue, Blackrock, Co. Dublin, also general charge. \*Nil. March 17, 1949.

### Satisfaction

**BRITISH THOMSON-HOUSTON CO., LTD.,** London, W.C., electrical manufacturers. (M.S., 23/7/49.) Satisfaction June 23, of Trust Deed registered December 17, 1921 (fully).

## Company News

### Beecham Group, Ltd.

The directors of Beecham Group, Ltd., announce that in the year ended March 31, 1949, after providing for all charges, there is a surplus available for the deferred shares and reserves of £517,345 compared with £751,511 in the previous year. The directors do not propose to recommend any final dividend on the deferred shares (4 per cent last year). The distribution of 36 per cent, less tax, already made on the deferred shares absorbed £299,475. The profit on home, export and overseas business was £1,905,194 (£2,370,181).

### Les Manufactures des Glaces et Produits Chimiques Saint-Gobain

The French glass and chemical group, which owns a number of foreign subsidi-

aries, reports for 1948 a net profit of Fr.302 million (Fr.168 million). Dividend has been increased from Fr.41.25 to Fr.60 per share.

### Etablissements Kuhlmann

The Etablissements Kuhlmann Manufactures de Produits Chimiques du Nord reports for 1948 a net profit of Fr.248 million (Fr.114 million). Dividend Fr.80 (Fr.40), equal to 10 per cent (same) net per share.

The registered capital of THE YORKSHIRE DYEWARE & CHEMICAL CO., LTD., has been increased by £250,000 to £800,000. The board's intention to redeem the outstanding £56,513 four-and-a-half per cent first mortgage debenture stock is also announced.

## New Companies Registered

### Collins and Jervie (Amersham), Ltd.

Private company. (470,619). Capital £1000. Manufacturing chemists. Directors: M. Valentine, D. M. Fry. Reg. office: 6 Sycamore Road, Amersham, Bucks.

### G. & P. (Proprietaries), Ltd.

Private company. (470,709). Capital £10,000. Objects: To acquire the business of the Imperial Steel Company carried on at Sunderland; and to carry on the business of manufacturers of detergent tablets, chemicals and chemical products, acids, plasters, disinfectants, fertilisers, etc. Directors: W. A. Green, R. Porter. Reg. office: Sunnyside Chambers, St. Thomas Street, Sunderland.

### Niro Atomizer & Engineering, Ltd.

Private company. (470,717). Capital £5000. Manufacturers of atomisers, spray drying equipment, machinery for converting liquids into solids or solids into liquids or gaseous state. Directors: K. S. Openheimer, J. E. Nyrop, F. B. Cornwell, S. Squires. Reg. Office: 232 Gt. Portland Street, W.1.

The name of CHEMICAL INDUSTRIAL PRODUCTS (HULL), LTD., Equitable Chambers, Central Street, Halifax, has been changed to CHEMICAL INDUSTRIAL PRODUCTS (KEMMAL), LTD.

The name of L.P.C. LEAD PIGMENTS & CHEMICALS, LTD., 7 Gracechurch Street, E.C., has been changed to L.P.C. CHEMICALS & DYES, LTD.

## Chemical and Allied Stocks and Shares

**B**USINESS in stock markets remained on a moderate scale, but, with little selling, a firm appearance developed and British Funds and industrial shares tended to show small gains on balance. Sentiment was helped by the hope that, having regard to the successful outcome of the conference of Commonwealth finance ministers, it may not be necessary to make further reductions in imports of dollar goods in the autumn.

Shares of companies with important interests in the U.S., and also those of companies, which may increase their exports of goods to dollar countries, are favoured to some extent as are shares of commodity companies, such as rubber and base metal mines. But there may be little prospect of commodity companies earning better profits unless the U.S.A. is willing to pay higher prices for stock-piling purposes.

As was to be expected, shares of chemical and associated companies were helped by the better trend of markets. Imperial Chemical firmed up to 44s. 4½d., Turner & Newall have risen to 76s. 6d., United Molasses to 39s. and Borax Consolidated were steady at 50s. Later, however, Imperial Chemical came back to 44s. 1½d. British Oxygen have been firm at 92s. 9d. while British Aluminium were steady at 43s. 9d. Ilford rallied well to 21s. 10½d. and Monsanto were better at 53s. 1½d.

Albright & Wilson have remained at 27s. 9d. and Boake Roberts at 30s. Bowman Chemical 4s. shares were 7s., F. W. Berk 2s. 6d. ordinary 13s. and Amber Chemical 2s. shares 5s., while Brotherton 10s. ordinary were again at 20s. and Pest Control 5s. shares at 8s.

Among preference shares, L. B. Holliday 4½ per cent were 21s. 9d., W. J. Bush 4½ per cent 24s. 9d., and British Chemicals & Biologicals 4 per cent firmed up to 20s. 6d. B. Laporte 5s. ordinary strengthened further to 21s. on the latest developments.

Cement shares have attracted more attention at higher prices, Tunnel at 49s. 3d. responding to the higher profits and increased dividend, while Associated Cement were 76s. 3d. and British Portland 73s. 9d. British Plaster Board at 23s. 4½d. responded further to the results and bonus. British Match at 33s. and Lever & Unilever at 47s. 3d. have been firm on further consideration of the past year's figures. Triplex Glass 10s. shares have changed hands over 20s. on market talk of good results and a possible share bonus.

Boots Drug (50s.) have been firm on the full report and accounts, Glaxo Laboratories, after easing, firmed up to £17½, British Industrial Plastics 2s. shares improved to 4s. 10½d., and De La Rue were better at 27s. and British Xylonite 67s. 6d.

Beechams deferred at 13s. 3d. were unaffected by the lower dividend, Sangers 5s. ordinary have been firm at 29s., Griffiths Hughes at 18s. 9d. and British Glues 18s. 3d.

Oil shares moved irregularly, although Apex Trinidad were good at 33s. Anglo-Iranian at £7 19/32 were easier on official news of the outcome of the negotiations with the Persian Government.

### British Chemical Prices

**T**RADING conditions on the industrial chemicals market remain fairly brisk, with the movement to the main consuming industries continuing on a satisfactory scale. Since last week an increase in the controlled price of pig lead has been notified and the prices for white lead and red lead have been advanced accordingly. White lead is now £109 10s. per ton and red lead £99 per ton. The majority of the soda compounds continue in good demand with supplies of soda ash and caustic soda being fully taken up. The potash chemicals generally remain firm. Formaldehyde, borax, hydrogen peroxide and the barium compounds are other items which are attracting a fair amount of buying interest. Subdued conditions persist on the coal-tar products market and buying both for home and for shipment has only been of moderate extent.

**MANCHESTER.**—The past week has been little change of any consequence in trading conditions on the Manchester chemical market, although the uncertainty regarding future price movements of non-ferrous metal products tends to make for cautious buying. In most other directions, delivery specifications, especially for the alkalis and other leading heavy chemicals, has covered a steady tonnage, but holiday conditions continue to affect the volume.

**GLASGOW.**—The volume of business transacted in the Scottish chemical market during the past week has been very restricted, because of the holidays, with very little buying being done. There have been a few price changes, mainly decreases in price, among which the rise in value of bleaching powder was a notable exception.

## Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

### Complete Specifications Accepted

Production from acetylene of aromatic hydrocarbons and of saturated and unsaturated hydrocarbons.—Synben Akt.-Ges. Nov. 19, 1940. 623,722.

Compositions containing aminotriazine-aldehyde condensation products and methods of preparing same.—American Cyanamid Co. July 31, 1942. 623,355.

Coating of non-fibrous cellulosic bodies.—American Cyanamid Co. April 30, 1943. 623,357.

Alloy iron castings and method of producing the same.—Hepworth & Grandage, Ltd., and H. Forrest. Jan. 4, 1945. 623,360.

Colloidal aqueous dispersion of a resinous copolymer of melamine, urea and formaldehyde.—American Cyanamid Co. Jan. 4, 1944. (Addition to 623,355.) 623,361.

Melamine-formaldehyde condensation product dispersions.—American Cyanamid Co. Dec. 30, 1943. (Addition to 623,355.) 623,362.

Anti-toxic agents.—J. F. Danielli, P. D. Mitchell, M. Danielli, L. N. Owen and G. Shaw. Dec. 10, 1945. 623,377.

Variable resistors particularly for measuring devices.—Liquidometer Corporation. Sept. 24, 1945. 623,637.

Apparatus for the conveyance of liquids to atomising discs.—C. Andermatt. March 17, 1945. 623,731.

Machines for the manufacture of stranded textile filaments.—M. Kaplinsky. June 28, 1945. 623,384.

Sterilisation of partially oxidised cellulose fibres and means for effecting the same.—Parke, Davis & Co. June 18, 1945. 623,733.

Distilling and rectifying apparatus.—Union Chimique Belge Soc. Anon. April 25, 1945. 623,388.

Plasticised polyvinyl and polyvinylidene resin compositions.—L. Berger & Sons, Ltd. (Sherwin-Williams Co.). May 24, 1946. 623,743.

Tools for use in opening and sealing drums and the like containers.—British Industrial Solvents, Ltd., and R. M. Howell. May 31, 1946. 623,394.

Processes and apparatus for the regeneration of spent iron and steel acid pickle liquors.—N. Swindin. June 6, 1946. 623,446.

Manufacture of nitro-dyestuffs.—British Celanese, Ltd. June 21, 1945. 623,399.

Device for applying chemicals and

minerals for therapeutic purposes.—F. Schwab. June 27, 1946. 623,400.

Liquid measuring and filling means for containers, tins and the like.—R. Abrahamsen. Aug. 21, 1940. 623,562.

Insulating coverings particularly for castings and method of forming same.—Ferro Engineering Co. July 28, 1945. 623,642.

Production of viscose.—Rayonier, Inc. Nov. 27, 1945. 623,566.

Preparation of dialkyl esters of fumaric acid from maleic anhydride.—Wingfoot Corporation. March 13, 1946. 623,409.

Dehydro-iso-androsterone and process of producing the same.—Glidden Co. May 8, 1946. 623,754.

Derivatives of polyvinylisocyanate.—General Aniline & Film Corporation. Oct. 23, 1945. 623,416.

Polyvinylisocyanate and derivatives thereof.—General Aniline & Film Corporation. Oct. 23, 1945. 623,417.

Preparation of boron hydrides.—British Thomson-Houston Co., Ltd. Oct. 22, 1945. 623,760, 623,761.

Process of recovery of hard metal carbides from sintered hard metal scrap.—E. A. Pokorny and H. W. Pokorny. Oct. 24, 1946. 623,577.

Manufacture of bodies of chemically reactive carbon for use as a reagent in certain chemical reactions.—C.U.R.A. Patents, Ltd., W. J. Kramers and M. Pirani. Oct. 28, 1946. 623,764.

Manufacture of gel catalysts.—Standard Oil Development Co. Dec. 6, 1945. 623,578.

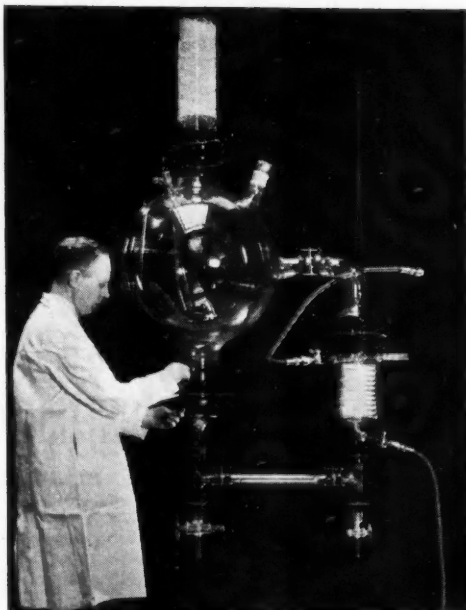
Process for effecting the adhesion of two or more plies of fabric to form a laminated sheet.—A. Felix, J. J. Horn, M. Horn and H. Horn. Oct. 30, 1946. (Cognate Application 17456/47.) 623,579.

Aluminium-magnesium alloys.—Acme Aluminium Alloys, Inc. Nov. 27, 1945. 623,452, 623,453.

Recovery of ethylene oxide.—Distillers Co., Ltd., and F. J. Wilkins. Nov. 13, 1946. 623,583.

Manufacture of derivatives of the cyclopentanopolhydrophenanthrene series.—Ciba, Ltd. Nov. 30, 1945. (Cognate Applications 34838/46, 34889/46 and 34890/46.) 623,586.

Process for the manufacture of cyclohexane by catalytic hydrogenation of benzene in the vapour phase.—Naamlooze



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**"Quickfit" Works, Stone, Staffs. Tel : Stone 481**

Venootschap de Bataafsche Petroleum Maatschappij. Dec. 20, 1945. 623,425.

Vibration dampeners.—Jack & Heintz Precision Industries, Inc. Jan. 5, 1946. 623,426.

Methods of and apparatus for manufacturing articles by extrusion.—E. C. Snelgrove. Dec. 7, 1946. (Cognate Applications 37083/46 and 606/47.) 623,773.

Manufacture of para-nitrobenzine sulphonylchloride.—Allied Chemical & Dye Corporation and H. J. Fitzpatrick. Dec. 13, 1946. (Addition to 602,597.) 623,774.

Manufacture of substituted ethylenes.—Ciba, Ltd. Dec. 22, 1945. (Cognate Application 37279/46.) (Addition to 600,696.) 623,428.

Manufacture of dyestuff preparations.—Ciba, Ltd. Dec. 22, 1945. (Cognate Application 37282/46.) 623,429.

Micro-hardness tester.—E. B. Bergsman. Dec. 24, 1946. 623,432.

Pigment compositions. — American Cyanamid Co. Jan. 25, 1946. 623,590.

Green pigment compositions.—American Cyanamid Co. March 7, 1946. 623,593.

Apparatus for washing out oil tanks, vats, and the like containers.—Merryweather & Sons, Ltd., R. E. Stubington and L. C. Miller. Feb. 4, 1947. 623,780.

Catalysts.—Imperial Chemical Industries, Ltd., and P. W. Reynolds. Feb. 26, 1947. 623,595.

Method of treating a tow of filaments or threads.—Imperial Chemical Industries, Ltd., R. H. K. Thomson, W. E. Tetlaw and A. M. McDonald. March 10, 1947. 623,460.

Method of producing 5:6-dimethoxy-8-aminoquinoline.—T. A. Williamson. April 8, 1946. 623,789.

Preparation of cellulose ethers.—Herules Powder Co. Dec. 24, 1946. 623,607.

Polymerisation of ethylenically unsaturated compounds.—E. I. Du Pont de Nemours & Co. April 26, 1946. 623,472.

Conveyors.—J. Collis & Sons, Ltd., and L. A. Collis. May 1, 1947. 623,481.

Process for the manufacture of 2-carboxymethylmercaptobenzene stibonic acid.—F. Hoffman-La Roche & Co. Akt.-Ges. June 14, 1946. 623,488.

Pulverising of sulphur and like materials.—A. J. Sturges-Beer. May 5, 1947. 623,499.

Manufacture of glycol esters of terephthalic acid.—Imperial Chemical Industries, Ltd., and A. C. Farthing. May 9, 1947. 623,669.

Valves for the control of fluid-flow.—W. B. Monteath and S. C. McBirnie. May 14, 1947. 623,696.

Heating or cooling apparatus for liquids or semi-liquids.—B. D. Winsor. May 14, 1947. 623,699.



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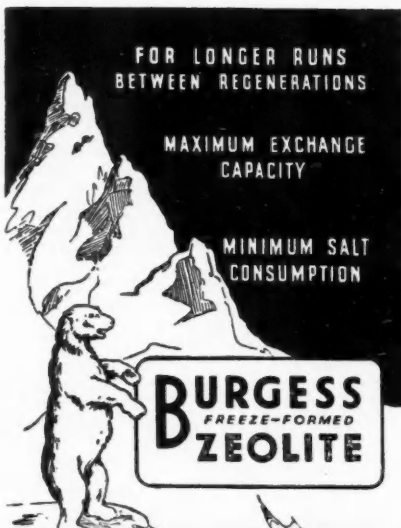
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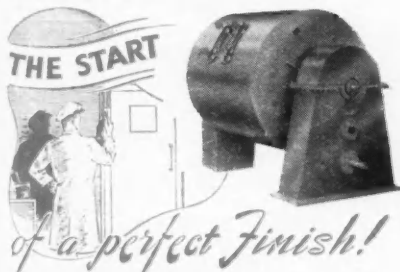
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